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REPORT

OF THE

ADJUTANT-GENERAL,

STATE OF CONNECTICUT,

TO THE

COMMANDER-IN-CHIEF,

FOR THE YEAR 1883.

PRINTED BY ORDER OF THE LEGISLATURE.

HARTFORD:
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1884.

REPORT.

ADJUTANT-GENERAL'S OFFICE,
HARTFORD, CONN., December 1, 1883.

To His Excellency T. M. WALLER,
Governor and Commander-in-Chief:—

SIR:

The annual report of this department is herewith respectfully presented for your consideration.

The active militia of the State, known as the Connecticut National Guard, is organized into a brigade, consisting of a light battery of four guns, four regiments of infantry, one from each congressional district, and one battalion, colored, of infantry, a total of 2,391 men. The brigade is commanded by a Brigadier-General having the full staff of his rank.

Armories are furnished by the State wherever companies may be located, for the storage of all military material belonging to them, as well as for giving the usual instruction of the drill room.

In arming and equipping its troops, the State has followed the system adopted by the general government. A portion of the rifles, breech-loading, were drawn from the United States, and all take the same cartridge. During the past year new and improved cartridge boxes of the United States pattern have been issued to all but one regiment. Everything required for immediate service is in good shape, excepting the artillery harness, which should be replaced. The organization and administration is much the same as that of regulars.

It is only by associating with the Connecticut National Guard in camp that one can get a fair idea of the proficiency it has attained in military duties, and its probable reliability if called into active service.

THE ENCAMPMENT.

The annual encampment was from September 10 to 15, inclusive. For the first time the entire brigade was present. The total number being 2,209 officers and men, a percentage of 91 $\frac{69}{100}$ of the entire

strength. Notwithstanding there was considerable cold and stormy weather, military men pronounced it to have been the most successful and strictly military encampment held under the present organization of the active militia. The routine of past years was varied by the setting aside of one day to march into the country, taking cooked rations, blank cartridges, ambulances, with the accessories of an armed body on active service. The object of this movement was to practically instruct the brigade in marching, attack, defense, etc., etc. The complete success of the day reflected much credit upon the participants.*

The general discipline of camp was good. In some matters it might have been improved; but it is not well to be too exacting. This body of over two thousand men lay alongside of Niantic, with its gardens and fruit yards, for one week, including a day's march in the country in the midst of loaded orchards, yet not five people complained of soldiers doing mischief in their foraging pranks. A good showing for any troops. Let it be understood that this creditable state of discipline has not been attained in a day, but only after years of persistent work of faithful officers, seconded by a devotion to duty no less commendable of the mass of the rank and file. The sanitary measures adopted and carried out were simply beyond all praise for their excellence.†

The growing tendency to construct buildings and make improvements of various kinds will, if not checked, turn the camp ground into a cantonment more suitable for permanent garrison service than to that of learning field duty. This is deprecated.

As encampments are usually graced by the presence of friends and military guests, the many demands upon the hospitalities of members sometimes leads to over-indulgence in liquor. The true way of avoiding this evil is to follow the example of many of the best officers in banishing the bottle from their quarters.

The colored battalion, brigaded for the first time in camp with the main body of the guard, was as much pleased with its successful tour of duty as gratified by the invariable courtesy received from its white comrades.

LOSS AND GAIN.

There has been a total loss during the year, from expiration of

* The report of the Brigadier-General commanding will be found attached.

† The report of the Medical Director will be found attached.

service and other causes, of 769 members. The gain during the same period is 793.

EXPENDITURES OF NATIONAL GUARD.

Amount drawn from the Comptroller	$170,294 49
In the hands of Adjutant-General, $638.17; balance in the hands of Paymaster-General, $1,674.51	2,312 68
Expended and charged to National Guard	$167,981 81

Of which the unusual expenditures were mostly as follows:

For armory building	$50,000 00
Legislative appropriation for mess houses and grading of camp ground,	8,500 00
Burial of indigent veterans	1,911 00
Rifle sights	1,072 36
Purchase of tents	907 50
Encamping the colored battalion	3,750 00
	$66,140 86

There were other considerable expenditures by the Quartermaster-General, which will not have to be repeated.

ENROLLMENT.

The enrollment of citizens liable to military duty for the current year is 75,748 men. Subject to tax, 52,276. Sum collected by the State Treasurer, $93,693.60—a slight increase over last year, which was $93,981.24, if the unpaid tax of Danbury and some minor towns is counted in.

OFFICE EXPENSES.

Expenditures in the Adjutant-General's office for the current year ending November 30, 1883:

Paid to employees	$514 50	
Paid for printing	300 60	
Paid for stationery and stationery material	237 51	
Paid for postage stamps	242 50	
Paid for telegraphing, telephone and express	45 30	
Paid for traveling expenses	21 42	
	$1,361 83	
Drawn from Comptroller	2,000 00	
Balance in State Bank of Hartford to credit of Adjutant-General,		$638 17

PENSIONS.

Number of claims passing through this office, allowed during the year, 93. Amount of money received, $61,729.09.

Claims for bounty allowed, 15, amounting to $1,507.04.

This office executes pension vouchers, free of charge, to some 200 pensioners.

The pension business of this office is diminishing.

Some worthy pension claims, having, so far as is known, all the necessary documentary evidence, are before the Commissioner at Washington. From the constant courtesy of that officer, it is possible a settlement might be hastened if there was an expert present to bring those special cases to his special attention.

WOUNDED SOLDIER.

Richard H. Clark, a private of the light battery, on duty in camp, lost his right hand by the premature explosion of the gun at which he was serving.

Chapter VI., Section 7, Militia Law, reads: "Every officer or soldier wounded or disabled, and the widow and children of every officer or soldier killed while in the service of the State, shall be suitably provided for by the General Assembly."

ARMORIES.

Extract from the Act relating to armories:

SECTION 1. "In all towns of the State where two or more military companies are located, suitable armory accommodations for the use of said companies may be built or purchased by the State, not over fifty thousand dollars to be expended in any one year, and the total expenditure not to exceed two hundred thousand dollars.

SEC. 2. All contracts and transactions for building and purchasing armories under the provisions of this act shall be by commission, to consist of the Governor, Adjutant-General, and Quartermaster-General of the State for the time being."

Last year the commission, of which Governor Bigelow was chairman, purchased sites in New Haven, Waterbury, Bridgeport and New London. The same commission also contracted for the erection of armories in the two former cities, which have been completed during this present year. Amount expended for New Haven armory, and due, $68,000; for Waterbury armory, paid and due, $25,306.53; lots in Bridgeport and New London, $10,223.34; balance of appropriation, $95,000.*

The commission, of which your excellency is chairman, has taken

* These figures may vary a few hundred dollars in consequence of unadjusted claims, etc. In final settlement, some small expenses may be transferred from one armory to the other.

no steps towards constructing the remaining armories, mainly for the reason that those towns entitled to them by the act, Bridgeport, New London, Hartford, New Britain, Norwalk and Willimantic, cannot have suitable ones built for the sum now standing to the credit of the appropriation.

In the absence of special estimates, it is believed that not less than $50,000 additional will be required to carry out the intentions of the General Assembly, and such sum is respectfully recommended to be appropriated.

SICK AND DISABLED VETERANS.

A Hospital Board, consisting of the Governor, Adjutant-General and Surgeon-General, is authorized to send to the hospitals of New Haven, Hartford, and Fitch's Home for soldiers, Darien, veterans needing medical treatment. The Board also determines the weekly allowance to be paid for their maintenance. Last spring the managers of the Hartford and New Haven institutions demanded that the weekly stipend of $4.50 be increased to $6.50, claiming the actual cost of support for each inmate was $6.70. The Board consented to an addition of $1.00, making the present rate in these hospitals $5.50. At Fitch's Home, where a class of inmates are provided for requiring less medical attention, the weekly rate has been fixed at $4.00, and for insane veterans at Middletown, $3.75 per week. The two latter are reductions, to take effect January 1, 1884.

Number of admissions during the year at the four asylums..... 196
Remaining at the end of the fiscal year, November 30..... 62
Received at Fitch's Home during the year, and maintained at the expense of that institution..... 23

The subject of a State Soldiers' Home has been considered. An institution of this kind necessarily includes a corps of paid officials, among whom would be medical officers, attendants and servants. It is doubtful if the State's burdens would be lessened thereby, or the wards better looked after, than under the present system.

These four institutions, at which veterans are maintained by the State, were incorporated expressly for the purpose of relieving the afflicted, or, as with the Soldiers' Home at Darien, to provide a shelter for those having just claims upon the beneficence of the State. If, therefore, there is any profit from the allowances, that simply places additional means at the disposal of these asylums to increase their usefulness.

Infirm and disabled soldiers and sailors, who were discharged from

the United States service for *disability*, are eligible to admission in a national home. So far as can be readily ascertained, some 300 from the State have thus found an asylum. Recently this department ruled that the General Assembly did not include that class of wards among those entitled to its provision for the support of disabled veterans. Exceptions having been taken to that decision, it is hoped that the Legislature will plainly express its intent of the law upon the subject.

IN CONCLUSION.

The Adjutant-General's and the Quartermaster-General's departments need a legislative reorganization that shall take effect at the expiration of your administration.

I submit herewith the following reports, tables, etc.:

1. Roster of National Guard.
2. Abstract of muster, November, 1883.
3. Table of enlistments, discharges, etc.
4. Consolidated morning report of encampment.
5. Military enrollment.
6. Report of Brigadier-General Stephen R. Smith, commanding brigade.
7. Reports of officers regarding military duties.
8. Report of Brigade Inspector of Target Practice, with list of sharpshooters and marksmen for 1883.
9. Report of Examining Board.
10. General Orders for 1883.

I have the honor to be &c., &c.,

D. N. COUCH,

Adjutant-General.

Necrology.

CAPTAIN LEVI H. HOTCHKISS,

COMMANDING COMPANY F, FIRST REGIMENT,
DIED JANUARY 5, 1883.

COLONEL JOSEPH J. SWEENEY,

ASSISTANT ADJUTANT-GENERAL—APPOINTED JAN. 20, 1883,
DIED SEPTEMBER 8, 1883.

MR. BENJAMIN FITCH,

THE FOUNDER OF FITCH'S HOME FOR SOLDIERS, DARIEN,
DIED NOVEMBER 7, 1883.

CAPTAIN FRANK W. TIESING,

COMMANDING COMPANY B, SECOND REGIMENT,
DIED NOVEMBER 8, 1883.

ROSTER.

COMMANDER-IN-CHIEF AND STAFF.

Commander-in-Chief.

THOMAS M. WALLER, New London.

Adjutant-General—Rank, Brigadier-General.

	Date of Rank.
DARIUS N. COUCH, Norwalk,	Jan. 3, 1883

Quartermaster-General—Rank, Brigadier-General.

THOMAS McMANUS, Hartford,	Jan. 3, 1883

Paymaster-General—Rank, Brigadier-General.

JAMES B. COIT, Norwich,	Jan. 3, 1883

Surgeon-General—Rank, Brigadier-General.

EVELYN L. BISSELL, New Haven,	Jan. 3, 1883

Commissary-General—Rank, Brigadier-General.

FRANCIS A. MARDEN, Stamford,	Jan. 3, 1883

Aids to the Commander-in-Chief—Rank, Colonel.

NORRIS G. OSBORN, New Haven,	Jan. 3, 1883
WILLIAM N. WOODRUFF, Hartford,	Jan. 3, 1883
LUKE M. HEEREY, Sprague,	Jan. 3, 1883
GEORGE D. POST, Putnam,	Jan. 3, 1883

Assistant Adjutant-General—Rank, Colonel.

*EDWARD M. GRAVES, New Haven,	Oct. 1, 1883

Assistant Quartermaster-General—Rank, Lieutenant-Colonel.

†JABEZ L. WOODBRIDGE, Manchester,	Jan. 3, 1883

* By statute, this officer is appointed by the Adjutant-General, with the consent of the Commander-in-Chief.

† By statute, this officer is appointed by the Quartermaster-General, with the consent of the Commander-in-Chief.

CONNECTICUT NATIONAL GUARD.

Brigadier-General.

	Date of Rank.
STEPHEN R. SMITH, New Haven,	July 6, 1878

Assistant Adjutant-General—Rank, Lieutenant-Colonel.

LEWIS L. MORGAN, New Haven,	July 6, 1878

Brigade Inspector—Rank, Major.

JOHN B. CLAPP, Hartford,	July 6, 1878

Brigade Quartermaster—Rank, Major.

THOMAS L. WATSON, Bridgeport,	Jan. 30, 1879

Brigade Commissary—Rank, Major.

EDWARD S. HAYDEN, Waterbury,	Jan. 23, 1883

Brigade Inspector of Rifle Practice—Rank, Major.

FREDERICK A. SPENCER, Waterbury,	May 8, 1882

Medical Director—Rank, Lieutenant-Colonel.

CHARLES M. CARLETON, Norwich,	June 14, 1883

Engineer and Signal Officer—Rank, Major.

CHARLES L. BURDETT, Hartford,	June 14, 1883

Aides-de-Camp—Rank, Captain.

WILLIAM H. STEVENSON, Bridgeport,	Mar. 29, 1879
WILLIAM H. STRATTON, New Haven,	Aug. 17, 1883

ARTILLERY.

BATTERY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	WILLIAM H. LEE,	Guilford,	Nov. 28, 1881

FIRST PLATOON.

1st Lieutenant,	ARTHUR S. FOWLER,	Guilford,	Jan. 22, 1883
2d Lieutenant,	EDWARD M. GILLETTE,	Guilford,	Jan. 22, 1883

SECOND PLATOON.

Rank.	Name.	Residence.	Date of Rank.
1st Lieutenant,	HOLCOMB N. JONES,	Clinton,	Dec. 6, 1880
2d Lieutenant,	REUBEN H. W. KELSEY,	Clinton,	Dec. 6, 1880

FIRST REGIMENT.

Colonel.

	Date of Rank.
LUCIUS A. BARBOUR, Hartford,	June 26, 1878

Lieutenant-Colonel.

WILLIAM E. CONE, Hartford,	June 26, 1878

Major.

ARTHUR L. GOODRICH, Hartford,	Dec. 13, 1882

Adjutant—Rank, Captain.

JOHN K. WILLIAMS, Hartford,	Aug. 3, 1878

Quartermaster—Rank, First Lieutenant.

THERON C. SWAN, Hartford,	Mar. 13, 1882

Paymaster—Rank, First Lieutenant.

WILLIAM B. McCRAY, Hartford,	Aug. 23, 1878

Surgeon—Rank, Major.

HARMON G. HOWE, Hartford,	Aug. 17, 1883

Assistant Surgeon—Rank, First Lieutenant.

PHINEAS H. INGALLS, Hartford,	Aug. 17, 1883

Inspector of Rifle Practice—Rank, Captain.

JOHN W. CRANE, Hartford,	Mar. 10, 1883

Signal Officer—Rank, First Lieutenant.

THOMAS W. GLEASON, Hartford,	June 15, 1883

Chaplain.

JAMES W. COOPER, New Britain,	Aug. 30, 1878

COMPANY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	WILLIAM WESTPHAL,	Hartford,	Mar. 15, 1877
1st Lieutenant,	EDWARD SCHULZE,	Hartford,	Feb. 17, 1874
2d Lieutenant,	HENRY F. SMITH,	Hartford,	Mar. 15, 1877

COMPANY B.

Captain,	PATRICK J. MORAN,	Hartford,	Aug. 22, 1879
1st Lieutenant,	THOMAS F. FLANIGAN,	Hartford,	Aug. 22, 1879
2d Lieutenant,	PATRICK H. SMITH,	Hartford,	Aug. 22, 1879

COMPANY D.

Captain,	AUGUSTUS N. BENNETT,	New Britain,	Nov. 20, 1877
1st Lieutenant,	JOHN C. BINGHAM,	New Britain,	Jan. 5, 1875
2d Lieutenant,	WILLIAM E. ALLEN,	New Britain,	April 5, 1881

COMPANY E.

Captain,	ALFRED L. THOMPSON,	New Britain,	Oct. 3, 1883
1st Lieutenant,	THOMAS A. MCCONKEY,	New Britain,	Oct. 26, 1883
2d Lieutenant,	FREDRIC C. WILSON,	New Britain,	Oct. 26, 1883

COMPANY F.

Captain,	CHARLES E. THOMPSON,	Hartford,	Jan. 31, 1883
1st Lieutenant,	THOMAS T. WELLES,	Hartford,	Nov. 21, 1881
2d Lieutenant,	ALEXANDER ALLEN,	Hartford,	Nov. 21, 1881

COMPANY G.

Captain,	ARTHUR J. WETHERELL,	S. Manchester,	Jan. 8, 1883
1st Lieutenant,	JOHN HICKEY,	N. Manchester,	Feb. 5, 1883
2d Lieutenant,	GILBERT P. HURD,	Manchester,	June 4, 1883

COMPANY H.

Captain,	WILLIAM H. MCLEAN,	Hartford,	Dec. 27, 1883
1st Lieutenant,	FREEMAN D. TWITCHELL,	Hartford,	Dec. 27, 1883
2d Lieutenant,	LUCIEN P. SMITH,	Hartford,	April 17, 1883

COMPANY K.

Captain,	THOMAS M. SMITH,	Hartford,	Feb. 10, 1879
1st Lieutenant,	SAMUEL O. PRENTICE,	Hartford,	Feb. 19, 1883
2d Lieutenant,	JAMES H. JARMAN,	Hartford,	Feb. 19, 1883

SECOND REGIMENT.

	Date of Rank.
Colonel.	
CHARLES P. GRAHAM, Middletown,	July 15, 1878
Lieutenant-Colonel.	
WALTER J. LEAVENWORTH, Wallingford,	July 26, 1882
Major.	
CHARLES R. BANNON, Waterbury,	Aug. 15, 1881
Adjutant—Rank, Captain.	
JOSEPH T. ELLIOTT, Middletown,	Mar. 21, 1881
Quartermaster—Rank, First Lieutenant.	
EUGENE C. HILL, New Haven,	Aug. 20, 1883
Paymaster—Rank, First Lieutenant.	
WALTER M. WELLMAN, New Haven,	Aug. 20, 1883
Surgeon—Rank, Major.	
C. PURDY LINDSLEY, New Haven,	Feb. 21, 1883
Assistant Surgeon—Rank, First Lieutenant.	
CHARLES H. FRENCH, Waterbury,	May 14, 1883
Inspector of Rifle Practice—Rank, Captain.	
ANDREW ALLEN, New Haven,	Jan. 5, 1880
Signal Officer—Rank, First Lieutenant.	
WILLIAM E. JACKSON, New Haven,	July 2, 1883
Chaplain.	
MOSES H. HOUGHTON, New Haven,	May 4, 1882

COMPANY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	JOHN B. DOHERTY,	Waterbury,	Aug. 1, 1883
1st Lieutenant,	CHARLES E. HALL,	Waterbury,	Aug. 1, 1883
2d Lieutenant,	FRANK K. WOOLWORTH,	Waterbury,	Aug. 1, 1883

COMPANY B.

Captain,	WILLIAM KAEHRLE,	New Haven,	Nov. 30, 1883
1st Lieutenant,	JOHN GUTT,	New Haven,	Nov. 30, 1883
2d Lieutenant,	JOHN WIDMAN, JR.,	New Haven,	Nov. 30, 1883

COMPANY C.

Captain,	JOSEPH H. KEEFE,	New Haven,	Dec. 20, 1881
1st Lieutenant,	JOHN GARRITY,	New Haven,	June 12, 1883
2d Lieutenant,	TIMOTHY F. CALLAHAN,	New Haven,	June 12, 1883

COMPANY D.

Captain,	LUZERNE I. THOMAS,	New Haven,	Jan. 6, 1880
1st Lieutenant,	GEORGE LAWRENCE,	New Haven,	Jan. 6, 1880
2d Lieutenant,	RICHARD W. WAITE,	New Haven,	Jan. 6, 1880

COMPANY E.

Captain,	HENRY R. LOOMIS,	New Haven,	Nov. 4, 1878
1st Lieutenant,	SAMUEL A. DOWNES,	New Haven,	Mar. 1, 1875
2d Lieutenant,	THEODORE H. SUCHER.	New Haven,	Mar. 5, 1883

COMPANY F.

Captain,	GEORGE S. ARNOLD,	New Haven,	July 28, 1879
1st Lieutenant,	FRANK T. LEE,	New Haven,	Mar. 12, 1883
2d Lieutenant,	JOHN DRAINE,	New Haven,	Mar. 12, 1883

COMPANY G.

Captain,	PATRICK F. BANNON,	Waterbury,	Aug. 29, 1881
1st Lieutenant,	JAMES HORIGAN,	Waterbury,	Dec. 1, 1880
2d Lieutenant,	MICHAEL T. BRADLEY,	Waterbury,	July 23, 1883

COMPANY H.

Captain,	EVERETT O. SHALER,	Middletown,	Nov. 6, 1883
1st Lieutenant,	WESLEY U. PEARNE,	Middletown,	Jan. 24, 1882
2d Lieutenant,			

COMPANY I.

Captain,	HENRY B. WOOD,	Meriden,	April 5, 1877
1st Lieutenant,	JOHN N. LANE,	Meriden,	April 5, 1877
2d Lieutenant,	FREDERICK T. WARD,	Meriden,	April 14, 1881

COMPANY K.

Rank.	Name.	Residence.	Date of Rank.
Captain,	BRYANT A. TREAT,	Wallingford,	Mar. 1, 1883
1st Lieutenant,	GEORGE G. LABARNES,	Wallingford,	Dec. 26, 1878
2d Lieutenant,	CHARLES O. NORTON,	Wallingford,	May 8, 1879

THIRD REGIMENT.

Colonel.

	Date of Rank.
WILLIAM H. TUBBS, New London,	Mar. 6, 1878

Lieutenant-Colonel.

WILLIAM H. BENTLEY, New London,	Mar. 20, 1882

Major.

GEORGE HAVENS, New London,	Mar. 20, 1882

Adjutant—Rank, Captain.

HEZEKIAH B. SMITH, New London,	July 23, 1883

Quartermaster—Rank, First Lieutenant.

GEORGE W. PHILLIPS, Willimantic,	Mar. 30, 1878

Paymaster—Rank, First Lieutenant.

JOSEPH W. GILBERT, Norwich,	Feb. 14, 1874

Surgeon—Rank, Major.

JOHN G. STANTON, New London,	July 23, 1883

Assistant Surgeon—Rank, First Lieutenant.

WILLIAM B. YOUNG, Norwich,	Oct. 28, 1871

Inspector of Rifle Practice—Rank, Captain.

SAMUEL J. MILLER, Willimantic,	April 28, 1882

Signal Officer—Rank, First Lieutenant.

THOMAS O. THOMPSON, New London,	July 23, 1883

Chaplain.

EDWARD W. BACON, New London,	Mar. 30, 1878

COMPANY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	JOHN H. HOXIE,	Mystic Bridge,	Feb. 11, 1876
1st Lieutenant,	HENRY J. HILL,	Mystic River,	Oct. 1, 1879
2d Lieutenant,	WILLIAM C. JONES,	Mystic River,	Oct. 1, 1879

COMPANY B.

Captain,	MICHAEL TWOMEY,	Pawcatuck,	June 7, 1877
1st Lieutenant,	DANIEL KELEHER,	Pawcatuck,	May 16, 1882
2d Lieutenant,	CORNELIUS BRANSFIELD,	Pawcatuck,	May 16, 1882

COMPANY C.

Captain,	WILLIAM F. BIDWELL,	Norwich,	Nov. 21, 1881
1st Lieutenant,	CHARLES S. EBBERTS,	Norwich,	Aug. 2, 1881
2d Lieutenant,	CHARLES H. GILBERT,	Norwich,	Aug. 2, 1881

COMPANY D.

Captain,	FRED'K E. ST. CLARE,	New London,	Aug. 1, 1881
1st Lieutenant,	WILLIAM M. MASON,	New London,	Aug. 1, 1881
2d Lieutenant,	MICHAEL J. ROACH,	New London,	April 10, 1882

COMPANY E.

Captain,	THOMAS FORAN,	Willimantic,	Dec. 11, 1882
1st Lieutenant,	THOMAS ASHTON,	Willimantic,	Jan. 23, 1883
2d Lieutenant,	PATRICK FITZPATRICK,	Willimantic,	July 24, 1883

COMPANY G.

Captain,	CLINTON A. WINSLOW,	Putnam,	Nov. 15, 1883
1st Lieutenant,	DANIEL N. MEDBURY,	Putnam,	July 13, 1882
2d Lieutenant.	EZEKIEL W. WHITE,	Putnam,	Nov. 15, 1883

COMPANY I.

Captain,	ABNER N. STERRY,	New London,	Feb. 18, 1879
1st Lieutenant,	J. EMERSON HARRIS,	New London,	Nov, 19, 1878
2d Lieutenant,	FRANK P. GOFF,	New London,	May 16, 1882

COMPANY K.

Captain,	CARLILE P. BOYNTON,	Willimantic,	Mar. 6, 1882
1st Lieutenant,	GEORGE H. SPENCER,	Willimantic,	Mar. 24, 1883
2d Lieutenant,	WILLIAM A. CHURCH,	Willimantic,	Aug. 2, 1883

FOURTH REGIMENT.

Colonel.

	Date of Rank.
GEORGE S. CROFUT, Bethel,	Oct. 12, 1878

Lieutenant-Colonel.

HENRY SKINNER, Winsted,	Oct. 12, 1878

Major.

JAMES C. CROWE, South Norwalk,	Aug. 18, 1880

Adjutant—Rank, Captain.

DAVID T. HUBBELL, Bethel,	Aug. 21, 1871

Quartermaster—Rank, First Lieutenant.

HENRY N. FANTON, Danbury,	Feb. 15, 1880

Paymaster—Rank, First Lieutenant.

GEORGE S. ROWE, Winsted,	Nov. 2, 1878

Surgeon—Rank, Major.

GEORGE F. LEWIS, Bridgeport,	July 31, 1876

Assistant Surgeon—Rank, First Lieutenant.

WILLIAM C. BURKE, JR., South Norwalk,	May 28, 1877

Inspector of Rifle Practice—Rank, Captain.

SAMUEL C. KINGMAN, Bridgeport,	July 31, 1876

Signal Officer—Rank, First Lieutenant.

DAVID F. READ, Bridgeport,	Aug. 1, 1883

Chaplain.

SAMUEL SCOVILLE, Stamford,	Mar. 19, 1881

COMPANY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	FREDERICK COLE,	Redding,	Feb. 10, 1879
1st Lieutenant,	POWELL A. ROBERTS,	Bethel,	July 30, 1883
2d Lieutenant,			

COMPANY B.

Rank.	Name.	Residence.	Date of Rank.
Captain,	GEORGE W. CORNELL,	Bridgeport,	July 13, 1880
1st Lieutenant,	FRANCIS A. KING,	Bridgeport,	July 13, 1880
2d Lieutenant,	CHARLES A. BLAKEMAN,	Bridgeport,	Jan. 26, 1882

COMPANY D.

Captain,	NELSON TAYLOR, JR.,	So. Norwalk,	Nov. 9, 1883
1st Lieutenant,	ALVAN A. HAUSCHILDT,	So. Norwalk,	Sept. 17, 1880
2d Lieutenant,	WILLIAM F. WARDWELL,	Norwalk,	April 15, 1881

COMPANY E.

Captain,	JAMES SHERIDAN,	Bridgeport,	Dec. 31, 1880
1st Lieutenant,	JAMES DONNELLY,	Bridgeport,	Dec. 31, 1880
2d Lieutenant,	JOHN J. GLENNON,	Bridgeport,	Mar. 25, 1881

COMPANY F.

Captain,	ADDISON A. BETTS,	Norwalk,	May 4, 1880
1st Lieutenant,	FERDINAND B. SMITH,	Norwalk,	May 4, 1880
2d Lieutenant,	HARVEY M. KENT,	Norwalk,	July 15, 1881

COMPANY G.

Captain,	CHRISTIAN QUIEN,	Danbury,	June 26, 1882
1st Lieutenant,	FRANK R. NASH,	Danbury,	June 25, 1883
2d Lieutenant,	WILLIAM H. KNOWLES,	Danbury,	June 25, 1883

COMPANY I.

Captain,	EDWARD FINN,	Winsted,	May 20, 1881
1st Lieutenant,	ALFRED E. MOORE,	Winsted,	April 21, 1883
2d Lieutenant,	GEORGE E. WRIGHT,	Winsted,	April 21, 1883

COMPANY K.

Captain,	BRUCE H. WELLER,	Stratford,	July 24, 1883
1st Lieutenant,	EUGENE MOREHOUSE,	Stratford,	July 24, 1883
2d Lieutenant,	IRVING W. JUDSON,	Stratford,	July 24, 1883

FIFTH BATTALION (Colored).

Major.

	Date of Rank.
FRANK M. WELCH, Bridgeport,	Aug. 11, 1881

Adjutant—Rank, Captain.

JAMES O. JONES, New Haven,	Sept. 15, 1881

Quartermaster—Rank, First Lieutenant.

WILLIAM P. H. CROSS, Hartford,	Sept. 15, 1881

Assistant Surgeon—Rank, First Lieutenant.

WILLIAM H. DONALDSON, Bridgeport,	Aug. 28, 1883

COMPANY A.

Rank.	Name.	Residence.	Date of Rank.
Captain,	George W. Ladieu,	New Haven,	April 26, 1881
1st Lieutenant,	William R. Keyes,	New Haven,	April 26, 1881
2d Lieutenant,	Fleetwood C. Anthony,	New Haven,	April 26, 1881

COMPANY B.

Captain,	Lloyd G. Seymour,	Hartford,	May 21, 1879
1st Lieutenant,	L. Eugene Seymour,	Hartford,	Dec. 19, 1881
2d Lieutenant,	John Jones,	Hartford,	Dec. 19, 1881

COMPANY C.

Captain,	William H. Latimer,	Bridgeport,	Aug. 29, 1881
1st Lieutenant,	Charles H. Walker,	Bridgeport,	Sept. 3, 1883
2d Lieutenant,	William Sherman,	Bridgeport,	Oct. 2, 1883

JUDGE-ADVOCATES.

First Regimental District.

Major THOMAS McMANUS, Hartford,	July 17, 1872

Second Regimental District.

Major H. LYNDE HARRISON, New Haven,	June 18, 1872

Third Regimental District.

Major JOHN A. TIBBITS, New London,	June 1, 1881

Fourth Regimental District.

Major SAMUEL FESSENDEN, Stamford,	Aug. 30, 1872

[2]

ABSTRACT OF MUSTER ROLLS, NOVEMBER, 1883.

FIRST REGIMENT.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field, Staff and Band	Hartford	11	5	18	..	34	..	2	2	36	34
Company A	Hartford	3	14	2	44	63	..	3	3	66	52
Company B	Hartford	3	13	2	37	55	..	4	4	59	60
Company D	New Britain	2	14	2	28	46	1	9	10	56	56
Company E	New Britain	3	12	1	40	56	..	5	5	61	64
Company F	Hartford	3	13	1	45	62	..	2	2	64	60
Company G	S. Manchester	3	13	2	42	60	..	4	4	64	57
Company H	Hartford	3	13	2	35	53	..	5	5	58	59
Company K	Hartford	3	14	2	45	64	..	2	2	66	64
Total		34	111	32	316	493	1	36	37	530	506

Per cent. present, 93.02; gain over 1882, 1.72 per cent.

SECOND REGIMENT.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field, Staff and Band	Middletown	11	5	16	..	32	..	4	4	36	35
Company A	Waterbury	3	12	1	40	56	..	6	6	62	64
Company B	New Haven	1	14	1	37	53	1	3	4	57	53
Company C	New Haven	3	12	1	35	51	..	4	4	55	58
Company D	New Haven	3	14	1	32	50	..	2	2	52	57
Company E	New Haven	2	12	..	35	49	1	5	6	55	62
Company F	New Haven	3	13	2	31	49	..	1	1	50	52
Company G	Waterbury	3	12	1	34	50	..	12	12	62	64
Company H	Middletown	3	12	1	25	41	..	7	7	48	56
Company I	Meriden	3	14	2	33	52	..	5	5	57	56
Company K	Wallingford	3	11	..	42	56	..	9	9	65	52
Total		38	131	26	344	539	2	58	60	599	609

Per cent. present, 89.98; gain over 1882, 2.14 per cent.

THIRD REGIMENT.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field, Staff and Band..	New London.	11	5	18	..	34	..	2	2	36	35
Company A..	Mystic Bridge	3	12	2	16	33	..	16	16	49	53
Company B..	Pawcatuck...	3	12	1	26	42	..	9	9	51	58
Company C..	Norwich.....	3	13	2	33	51	..	7	7	58	57
Company D..	New London.	2	13	1	24	40	1	8	9	49	53
Company E..	Willimantic...	3	12	2	27	44	..	16	16	60	51
Company G..	Putnam.....	3	11	2	24	40	..	10	10	50	54
Company I..	New London.	3	10	..	27	40	..	20	20	60	54
Company K..	Willimantic...	3	9	2	20	34	..	8	8	42	53
Total.....	.....	34	97	30	197	358	1	96	97	455	468

Per cent. present, 78.68; gain over 1882, 10.52 per cent.

FOURTH REGIMENT.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field, Staff and Band..	Bethel	9	3	20	..	32	2	2	4	36	36
Company A..	Bethel	2	11	..	16	29	1	29	30	59	52
Company B..	Bridgeport....	3	12	2	34	51	..	15	15	66	62
Company D..	So. Norwalk.	2	10	1	32	45	1	17	18	63	64
Company E..	Bridgeport....	3	13	1	41	58	..	5	5	63	62
Company F..	Norwalk	3	13	2	32	50	..	10	10	60	51
Company G..	Danbury	3	13	..	27	43	..	17	17	60	63
Company I...	Winsted.....	3	14	1	32	50	..	8	8	58	56
Company K..	Stratford	3	13	2	28	46	..	10	10	56	55
Total.....	.....	31	102	29	242	404	4	113	117	521	501

Per cent. present, 77.54; loss from 1882, 4.30.

FIFTH BATTALION.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field & Staff.	Bridgeport...	4	2	..	..	6	..	1	1	7	6
Company A..	New Haven..	3	13	2	38	56	..	9	9	65	66
Company B..	Hartford.....	3	14	2	40	59	..	4	4	63	65
Company C..	Bridgeport...	3	12	2	35	52	..	7	7	59	60
Total.....	.....	13	41	6	113	173	..	21	21	194	197

Per cent. present, 89.18; loss from 1882, 4.72 per cent.

BATTERY A, ARTILLERY.

	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Field & Staff.	Guilford.....	1	4	..	..	5	..	..	..	5	5
1st Platoon...	Guilford.....	2	6	1	21	30	..	5	5	35	34
2d Platoon..	Clinton.....	2	6	..	23	31	..	9	9	40	37
Total.....	.....	5	16	1	44	66	..	14	14	80	76

Per cent. present, 82.50; gain over 1882, 11.45 per cent.

RECAPITULATION.

BRIGADE C. N. G.	LOCALITY.	PRESENT.					ABSENT.			AGGREGATE.	
		Commissioned Officers.	Non-Com. Officers.	Musicians	Privates.	Total.	Officers.	Enlisted Men.	Total.	1883.	1882.
Brig. General and Staff...	New Haven..	10	2	..	..	12	..	..	..	12	10
1st Regiment.	1st Cong. Dis.	34	111	32	316	493	1	36	37	530	506
2d Regiment.	2d Cong. Dis.	38	131	26	344	539	2	58	60	599	609
3d Regiment.	3d Cong. Dis.	34	97	30	197	358	1	96	97	455	468
4th Regiment.	4th Cong. Dis.	31	102	29	242	404	4	113	117	521	501
5th Battalion	State at Large	13	41	6	113	173	..	21	21	194	197
Battery A....	2d Cong. Dis.	5	16	1	44	66	..	14	14	80	76
Total.....	.....	165	500	124	1256	2045	8	338	346	2391	2367

Per cent. present for Brigade, 85.53; gain over 1882, 2.10 per cent.

TABLE OF ENLISTMENTS, DISCHARGES, ETC.—FROM MUSTER NOVEMBER, 1882, TO MUSTER, NOVEMBER, 1883,

	Muster, 1882.		Officers. Appointed.			Enlisted Men.			Gain.	Officers.				Enlisted Men. Discharged.								Loss.	Muster, 1883.			Term of service expires prior to Dec. 1, 1884.
	Officers.	Men.	From ranks	From civil life.	Transferred, or promoted into.	Enlisted.	Restored.	Transferred into.		Resigned.	Appointment revoked and discharged.	Transferred, or promoted from.	Died.	Expiration of term of service.	Non-residence	Disability.	Request of commanding officer.	Benefit of the service.	Dishon'bly.	Transferred, or promoted from.	Died.		Officers.	Men.		
Brig. Gen'l and Staff.	8	2	1	.....	3	1	.....	.....	5	2	.....	.....	...	1	.....	...	.....	.....	...	.....	...	3	10	2	Brig. Gen'l and Staff.	1
Battery A, Artillery..	5	71	1	.....	.....	17	.....	.....	17	1	.....	.....	...	11	.....	1	.....	.....	...	.....	...	13	5	75	Battery A, Artillery..	30
1st Regt. F. S. & B.....	10	24	1	2	1	10	.....	1	15	2	.....	1	...	6	1	...	.....	3	...	.....	...	13	11	25	1st R. gt. F. S. & B.....	2
Company A.....	3	49	.....	.....	.....	29	.....	.....	29	...	.....	.....	...	6	6	2	.....	1	...	.....	...	15	3	63	Company A.....	14
B.....	3	57	.....	.....	.....	13	.....	1	14	...	.....	.....	...	9	5	...	.....	1	...	.....	...	15	3	56	B.....	26
D.....	3	53	.....	.....	.....	21	.....	.....	21	...	.....	.....	...	13	4	1	.....	1	1	1	...	21	3	53	D.....	9
E.....	2	62	3	.....	.....	43	.....	1	44	2	.....	.....	...	5	12	2	.....	25	1	.....	...	47	3	58	E.....	6
F.....	3	57	.....	.....	1	27	.....	.....	28	...	.....	.....	1	13	8	...	.....	2	...	.....	...	24	3	61	F.....	16
G.....	3	54	2	.....	.....	30	.....	.....	30	2	.....	.....	...	7	10	...	.....	2	...	1	1	23	3	61	G.....	7
H	3	56	1	.....	.....	16	.....	.....	16	...	.....	1	...	7	4	1	.....	2	...	2	...	17	3	55	H.....	11
K.....	3	61	1	.....	.....	14	.....	.....	14	...	.....	1	...	1	5	2	.....	1	...	2	...	12	3	63	K.....	36
2d Regt. F. S. & B.....	10	25	2	4	.....	10	1	1	17	2	.....	3	...	4	1	1	.....	5	...	.....	...	16	11	25	2d Regt. F. S. & B.....	.....
Company A.....	3	61	1	.....	.....	19	.....	.....	19	1	.....	.....	...	9	8	...	.....	2	...	.....	1	21	3	59	Company A.....	8
B.....	3	50	.....	.....	.....	17	.....	.....	17	...	.....	.....	1	6	2	1	.....	3	...	.....	...	13	2	55	B.....	15
C.....	3	55	.....	1	.....	20	.....	.....	21	1	.....	.....	...	13	4	...	.....	4	...	1	1	24	3	52	C.....	10
D.....	3	54	.....	.....	.....	17	.....	.....	17	...	.....	.....	...	8	8	1	1	1	3	.....	...	22	3	49	D.....	7
E.....	3	59	1	.....	.....	17	.....	.....	17	1	.....	.....	...	10	9	...	.....	3	...	1	...	24	3	52	E.....	12
F.....	3	49	.....	1	.....	10	.....	1	12	1	.....	.....	...	8	4	...	.....	.....	...	1	...	14	3	47	F.....	5
G.....	3	61	2	.....	.....	10	.....	.....	10	1	.....	.....	...	5	3	...	.....	2	...	.....	1	12	3	59	G.....	12
H.....	3	53	.....	1	.....	16	.....	.....	17	1	.....	.....	...	6	16	...	.....	2	...	.....	...	25	3	45	H.....	6
I.....	3	53	.....	.....	.....	9	.....	2	11	...	.....	.....	...	6	4	...	.....	.....	...	.....	...	10	3	54	I.....	22
K.....	3	49	.....	1	.....	34	.....	.....	35	1	.....	.....	...	17	4	...	.....	.....	...	.....	...	22	3	62	K.....	12
3d Regt. F. S. & B.....	10	25	1	2	.....	16	.....	1	20	1	.....	1	...	14	2	...	.....	1	...	.....	...	19	11	25	3d Regt. F. S. & B.....	2
Company A.....	3	50	.....	.....	.....	12	.....	.....	12	...	.....	.....	...	6	9	...	.....	1	...	.....	...	16	3	46	Company A.....	11
B.....	3	55	.....	.....	.....	13	.....	.....	13	...	.....	.....	...	10	10	...	.....	.....	...	.....	...	20	3	48	B.....	6
C.....	3	54	.....	.....	.....	19	.....	.....	19	...	.....	.....	...	9	6	...	.....	.....	2	1	...	18	3	55	C.....	5
D.....	3	50	.....	.....	.....	13	.....	.....	13	...	.....	.....	...	12	1	...	.....	2	1	1	...	17	3	46	D.....	5
E.....	3	48	4	.....	.....	38	.....	.....	38	4	.....	.....	...	13	12	...	.....	.....	...	.....	...	29	3	57	E.....	7
G.....	3	51	1	1	.....	25	1	.....	27	...	.....	.....	...	9	17	1	.....	1	...	1	...	31	3	47	G.....	9
I.....	3	51	.....	.....	.....	15	.....	.....	15	...	.....	.....	...	1	7	...	.....	.....	...	1	...	9	3	57	I.....	26
K.....	3	50	2	.....	.....	11	.....	1	12	2	.....	.....	...	3	16	1	.....	1	...	.....	...	23	3	39	K.....	16
4th Regt. F. S. & B....	10	26	.....	2	.....	1	.....	.....	3	1	.....	.....	...	1	.....	...	.....	1	...	.....	...	3	11	25	4th Regt. F. S. & B....	11
Company A.....	3	49	1	.....	.....	14	.....	.....	14	1	.....	.....	...	5	.....	...	.....	1	...	.....	...	7	3	56	Company A.....	17
B.....	3	59	.....	.....	.....	16	1	1	18	...	.....	.....	...	10	3	...	.....	1	...	.....	...	14	3	63	B.....	10
D.....	3	61	.....	1	.....	16	.....	.....	17	1	.....	.....	...	11	1	2	.....	.....	1	2	...	18	3	60	D.....	15
E.....	3	59	.....	.....	.....	25	1	.....	26	...	.....	.....	...	22	2	...	.....	.....	1	.....	...	25	3	60	E.....	9
F.....	3	48	.....	.....	.....	14	.....	1	15	...	.....	.....	...	1	4	1	.....	.....	...	.....	...	6	3	57	F.....	2
G.....	3	60	.....	2	.....	22	.....	.....	24	1	2	.....	...	8	12	...	.....	3	...	.....	1	27	3	57	G.....	7
I.....	3	53	1	.....	.....	26	.....	.....	26	1	.....	.....	...	8	13	...	.....	1	...	.....	1	24	3	55	I.....	7
K.....	3	52	1	.....	.....	14	.....	.....	14	1	.....	.....	...	11	1	...	.....	.....	...	.....	...	13	3	53	K.....	19
5th Batt'n F. & S.....	3	3	.....	1	.....	.....	.....	1	2	.....	.....	.....	...	.....	.....	...	.....	.....	...	1	...	1	4	3	5th Batt'n F. & S.....	3
Company A.....	3	63	.....	.....	.....	13	.....	1	14	...	.....	.....	...	.....	5	...	.....	8	...	1	1	15	3	62	Company A.....	33
B.....	3	62	.....	.....	.....	9	.....	.....	9	...	.....	.....	...	.....	5	3	.....	1	1	.....	1	11	3	60	B.....	29
C.....	3	57	1	.....	.....	16	...	.....	16	1	.....	.....	...	.....	11	...	.....	4	...	.....	1	17	3	56	C.....	26
Totals,	166	2201	28	19	5	748	4	13	793	34	2	7	2	325	255	20	1	86	11	17	9	769	173	2218	Totals,	542
	2367																						2391			

CONSOLIDATED MORNING REPORT OF THE BRIGADE, NIANTIC, MONDAY, SEPTEMBER 10, TO

	PRESENT.																														Total present
	FOR DUTY.											SICK.								DETAILED.											
	General Officer.	Field Officers.	Commissioned Staff.	Non-Commissioned Staff.	Captains.	Lieutenants.	Sergeants.	Corporals.	Musicians.	Privates.	Total.	Field and Staff Officers.	Non Commissioned Staff.	Line Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Field and Staff Officers.	Non-Commissioned Staff.	Line Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.						
Sept. 8.																															
Brig. Gen. & Staff.	1	...	7	...	...	...	1	...	...	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...						9
Battery A	...	...	...	...	1	4	7	8	2	52	74	...	...	...	...	...	...	...	...	...	...	...	...	...	...						74
Sept. 9.																															
Brig. Gen. & Staff.	1	...	8	...	...	...	1	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...						10
Battery A	...	...	...	...	1	4	7	8	2	52	74	...	...	...	...	...	...	...	...	...	...	...	...	...	...						74
Brig. Gen & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	1	1	...	1	1	4						12
Battery A	...	...	...	3	1	3	4	8	1	52	72	...	...	...	...	...	...	...	...	...	...	...	...	...	...						76
1st Regiment	...	3	7	5	8	16	34	49	33	250	405	...	...	...	...	...	...	...	...	...	...	13	1	35	49						454
2d Regiment	...	3	8	5	9	20	53	65	18	327	508	...	...	...	...	...	...	...	...	...	...	6	...	22	28						536
3d Regiment	...	3	8	5	8	16	43	53	36	233	405	...	...	...	...	...	1	1	...	...	...	...	...	...	...						406
4th Regiment	...	3	7	5	8	15	40	61	34	299	472	...	...	...	...	...	...	...	...	...	...	1	8	...	4	13					485
5th Battalion	...	1	3	3	3	5	18	24	6	107	170	...	...	...	...	...	...	...	...	...	...	...	...	...	...						170
Total Sept. 10	1	13	42	26	37	75	194	260	128	1268	2044	...	...	...	...	...	1	1	...	1	2	27	2	62	94						2139
Brig. Gen. & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...						12
Battery A	...	...	...	4	1	4	4	8	2	55	78	...	...	...	...	...	...	...	...	...	...	...	...	...	...						78
1st Regiment	...	3	7	5	8	16	33	47	33	248	400	...	...	...	2	...	3	5	...	...	...	14	1	36	51						456
2d Regiment	...	3	8	5	9	20	53	63	39	304	504	...	...	...	...	...	1	1	...	...	...	7	...	23	30						535
3d Regiment	...	3	8	5	7	15	38	45	36	187	344	...	...	...	...	...	4	4	...	...	2	12	...	47	61						409
4th Regiment	...	3	7	5	8	13	38	59	34	285	452	...	...	...	...	...	1	1	...	...	3	10	...	20	33						486
5th Battalion	...	1	3	3	3	5	18	23	6	106	168	...	...	...	1	...	1	2	...	...	...	...	...	...	...						170
Total Sept. 11	1	13	42	27	36	73	186	245	150	1185	1958	...	...	...	3	...	10	13	...	...	5	43	1	126	175						2146
Brig. Gen. & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...						12
Battery A	...	...	...	4	1	4	4	8	2	52	75	...	...	...	...	...	3	3	...	...	...	...	...	...	...						78
1st Regiment	...	3	7	5	8	16	34	49	33	251	406	...	...	...	...	...	2	2	...	...	...	14	1	38	53						461
2d Regiment	...	3	8	5	9	20	52	61	39	304	501	...	...	...	...	...	3	3	...	...	...	6	...	25	31						535
3d Regiment	...	3	8	5	7	15	33	42	36	193	342	...	...	...	...	...	5	5	...	...	2	16	...	38	56						403
4th Regiment	...	3	7	5	7	13	40	56	35	279	445	...	...	...	1	...	5	6	...	...	5	11	...	21	37						488
5th Battalion	...	1	3	3	3	5	17	23	6	105	166	...	...	...	2	...	3	5	...	...	...	...	...	...	...						171
Total Sept. 12	1	13	42	27	35	73	182	239	151	1184	1947	...	...	...	3	...	21	24	...	...	7	47	1	122	177						2148
Brig. Gen. & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...						12
Battery A	...	...	...	4	1	4	4	8	2	53	76	...	...	...	...	...	...	...	...	...	...	...	...	...	...						76
1st Regiment	...	3	7	5	8	16	38	51	34	256	418	...	...	...	1	...	2	3	...	...	...	12	1	39	52						473
2d Regiment	...	3	8	5	9	20	54	67	21	320	507	...	...	...	...	...	2	2	...	...	...	5	...	25	30						539
3d Regiment	...	3	8	5	8	16	34	44	36	187	341	...	...	...	...	...	4	4	...	...	...	16	...	44	60						405
4th Regiment	...	3	7	5	8	14	37	58	35	281	448	...	...	...	...	...	2	2	...	...	2	10	...	18	30						480
5th Battalion	...	1	3	3	3	5	15	23	5	104	162	...	...	...	3	1	2	6	...	...	...	...	...	...	...						168
Total Sept. 13	1	13	42	27	37	75	184	251	133	1201	1964	...	...	...	4	1	12	17	...	...	2	43	1	126	172						2153
Brig. Gen. & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...						12
Battery A	...	...	...	4	1	4	4	8	2	52	75	...	...	...	...	...	1	1	...	...	...	...	...	...	...						76
1st Regiment	...	3	6	4	8	16	35	49	34	261	416	1	...	...	5	...	4	10	...	...	...	13	1	40	54						489
2d Regiment	...	3	8	5	9	19	54	65	36	307	506	...	...	...	...	...	2	2	...	...	...	6	...	24	30						538
3d Regiment	...	3	8	5	8	15	36	51	36	186	348	...	...	...	1	...	3	4	...	...	1	10	...	43	54						406
4th Regiment	...	3	7	5	7	14	36	56	35	276	439	...	...	...	...	...	5	5	...	...	3	11	...	20	34						478
5th Battalion	...	1	3	3	3	5	15	23	6	106	165	...	...	...	2	...	...	2	...	...	...	...	...	...	...						167
Total Sept. 14	1	13	41	26	36	73	182	252	149	1188	1961	1	...	...	8	...	15	24	...	...	4	40	1	127	172						2157
Brig. Gen. & Staff.	1	...	9	...	...	...	2	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...						12
Battery A	...	...	...	4	1	4	4	8	2	52	75	...	...	...	...	...	...	...	...	...	...	...	...	...	...						75
1st Regiment	...	3	7	5	8	16	36	49	34	265	423	...	...	...	3	...	1	4	...	...	...	14	1	40	55						482
2d Regiment	...	3	8	5	9	19	53	67	36	303	503	...	...	...	...	...	2	2	...	...	...	5	...	25	30						535
3d Regiment	...	3	8	5	7	14	35	44	36	189	341	...	...	...	1	...	4	5	...	...	3	16	...	46	65						411
4th Regiment	...	3	7	5	8	15	37	58	35	276	444	...	...	...	...	...	2	2	...	...	1	9	...	20	30						476
5th Battalion	...	1	3	3	3	5	16	23	6	106	166	...	...	...	...	1	...	1	...	...	...	...	...	...	...						167
Total Sept. 15	1	13	42	27	36	73	183	249	149	1191	1964	...	...	...	4	1	9	14	...	...	4	44	1	131	180						2158

CONNECTICUT NATIONAL GUARD, AT CAMP WALLER, SATURDAY, SEPTEMBER 15, INCLUSIVE, 1883.

ABSENT.															RECAPITULATION.								
WITH LEAVE.							WITHOUT LEAVE.							Total absent.	Present		Absent		Present & Absent.				
Field and Staff Officers.	Non-Commissioned Staff.	Line Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Field and Staff Officers	Non-Commissioned Staff.	Line Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.		Commissioned Officers.	Enlisted Men.	Commissioned Officers.	Enlisted Men.	Commissioned Officers.	Enlisted Men.	Aggregate.	Aggregate last Report.	
																							Sept. 8.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	8	1	.....	.....	8	1	9	.....	Brig. Gen. & Staff..
...	...	...	...	...	1	1	...	...	...	...	...	4	4	5	5	69	.....	5	5	74	79	.....	Battery A.....
																							Sept. 9.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	9	1	.....	.....	9	1	10	9	Brig. Gen. & Staff..
...	...	...	...	...	1	1	...	...	...	...	...	4	4	5	5	69	.....	5	5	74	79	79	Battery A.....
...	...	...	...	...	1	1	...	...	...	...	...	4	4	5	10	2	.....	.....	10	2	12	10	Brig. Gen. & Staff.
...	...	...	...	...	...	1	...	...	...	...	...	...	...	.....	5	71	.....	5	5	76	81	79	Battery A.....
1	...	...	...	...	...	1	...	...	...	11	1	64	76	77	34	420	1	76	35	496	531	.....	1st Regiment.....
...	...	1	5	...	21	27	...	...	...	7	1	33	41	68	40	496	1	67	41	553	604	.....	2d Regiment.....
...	...	...	2	...	1	3	...	...	...	5	...	25	30	33	35	371	...	33	35	404	439	.....	3d Regiment.....
...	...	...	4	...	15	19	...	...	...	1	1	20	22	41	34	451	.....	41	34	492	526	.....	4th Regiment.....
...	...	...	...	...	13	13	...	...	...	...	...	11	11	24	12	158	.....	24	12	182	194	.....	5th Battalion.....
1	...	1	11	...	51	64	...	...	...	24	3	157	184	248	170	1969	2	246	172	2215	2387	89	Total Sept. 10.....
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	10	2	.....	.....	10	2	12	12	Brig. Gen. & Staff.
...	...	...	...	...	1	1	...	...	...	...	...	2	2	3	5	73	.....	3	5	76	81	81	Battery A.....
1	...	...	...	...	...	1	...	...	...	11	2	60	73	74	34	422	1	73	35	495	530	531	1st Regiment.....
...	...	1	6	...	20	27	...	...	...	6	1	35	42	69	40	495	1	68	41	563	604	604	2d Regiment.....
...	...	...	7	...	7	14	..	...	...	5	...	26	31	45	35	374	.....	45	35	419	454	430	3d Regiment.....
...	...	...	4	...	14	18	...	...	...	1	1	20	22	40	34	452	.....	40	34	492	526	526	4th Regiment.....
...	...	...	...	...	13	13	...	...	...	...	...	11	11	24	12	158	.....	24	12	182	194	194	5th Battalion.....
1	...	1	17	...	55	74	...	...	...	23	4	154	181	255	170	1976	2	253	172	2229	2401	2387	Total Sept. 11.....
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	10	2	.....	.....	10	2	12	12	Brig. Gen. & Staff.
...	...	...	...	...	1	1	...	...	...	...	...	2	2	3	5	73	.....	3	5	76	81	81	Battery A.....
1	...	...	...	...	...	1	...	...	...	10	2	56	68	69	34	427	1	68	35	495	530	530	1st Regiment.....
...	...	1	6	...	14	21	...	...	...	8	1	38	47	68	40	495	1	67	41	562	603	604	2d Regiment.....
...	...	...	10	...	10	20	...	...	...	6	...	25	31	51	35	368	.....	51	35	419	454	454	3d Regiment.....
...	...	...	3	...	15	18	...	...	...	1	1	18	20	38	35	453	.....	38	35	491	526	526	4th Regiment.....
...	...	...	...	...	13	13	...	...	...	...	...	10	10	23	12	159	.....	23	12	182	194	194	5th Battalion.....
1	...	1	19	...	53	74	...	...	...	25	4	149	178	252	171	1977	2	250	173	2227	2400	2401	Total Sept. 12....
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	10	2	.....	.....	10	2	12	12	Brig. Gen. & Staff.
...	...	...	...	...	2	2	...	...	...	...	...	2	2	4	5	71	.....	4	5	75	80	81	Battery A.....
1	...	...	...	...	1	...	...	...	...	5	1	50	56	57	34	439	1	56	35	495	530	530	1st Regiment.....
...	...	1	6	...	14	21	...	...	...	3	2	41	46	67	40	499	1	66	41	565	606	603	2d Regiment.....
...	...	...	7	...	13	20	...	...	...	5	...	25	30	50	35	370	.....	50	35	420	455	454	3d Regiment.....
...	...	...	6	...	20	26	...	...	...	1	1	18	20	46	34	446	....	46	34	492	526	526	4th Regiment.....
...	...	...	1	...	13	14	...	...	...	...	...	12	12	26	12	156	.....	26	12	182	194	194	5th Battalion.....
1	...	1	20	...	62	84	...	...	...	14	4	148	166	250	170	1983	2	248	172	2231	2403	2400	Total Sept. 13....
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	10	2	.....	.....	10	2	12	12	Brig. Gen. & Staff.
...	...	...	...	...	2	2	...	...	...	...	...	2	2	4	5	71	.....	4	5	75	80	80	Battery A.....
1	1	...	...	...	..	2	...	...	...	5	1	42	48	50	34	446	1	49	35	495	530	530	1st Regiment.....
...	...	2	8	1	18	29	...	...	...	2	2	35	39	68	39	499	.....	68	41	567	608	606	2d Regiment.....
...	...	...	5	...	8	13	...	...	...	4	...	31	35	48	35	371	.....	48	35	419	454	455	3d Regiment.....
...	...	...	7	...	21	28	...	...	...	1	1	18	20	48	34	444	.....	48	34	492	526	526	4th Regiment.....
...	...	...	2	...	14	16	...	...	...	...	...	11	11	27	12	155	.....	27	12	182	194	194	5th Battalion.....
1	1	2	22	1	63	90	...	...	...	12	4	139	155	245	169	1988	1	244	172	2232	2404	2403	Total Sept 14....
...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	10	2	.....	.....	10	2	12	12	Brig. Gen. & Staff.
...	...	...	...	...	3	3	...	...	...	...	...	2	2	5	5	70	.....	5	5	75	80	80	Battery A.....
1	...	...	...	...	...	1	...	...	...	5	1	41	47	48	34	448	1	47	35	495	530	530	1st Regiment.....
...	...	2	8	1	21	32	...	...	...	2	2	35	39	71	39	496	2	69	41	565	606	608	2d Regiment.....
...	...	...	5	...	8	13	...	...	...	5	...	25	30	43	35	376	.....	43	35	419	454	454	3d Regiment.....
...	...	...	7	...	23	30	...	...	...	1	1	18	20	50	34	442	.....	50	34	492	526	526	4th Regiment.....
...	...	...	2	...	14	16	...	...	...	...	...	11	11	27	12	155	.....	27	12	182	194	194	5th Battalion.....
1	...	2	22	1	69	95	...	...	...	13	4	132	149	244	169	1989	3	241	172	2230	2402	2404	Total Sept. 15 ...

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MILITARY ENROLLMENT.

HARTFORD COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Hartford	6,040	3,962
Avon	139	104
Berlin	269	194
Bloomfield	156	121
Bristol	768	420
Burlington	164	120
Canton	266	215
East Granby	78	56
East Hartford	459	295
East Windsor	279	224
Enfield	787	523
Farmington	465	299
Glastonbury	382	277
Granby	221	181
Hartland	105	85
Manchester	602	453
Marlborough	35	25
New Britain	1,718	929
Newington	89	56
Plainville	253	179
Rocky Hill	93	56
Simsbury	240	194
Southington	599	469
South Windsor	276	222
Suffield	337	292
West Hartford	200	142
Wethersfield	213	107
Windsor	365	230
Windsor Locks	313	232
Total	15,911	10,662

TOLLAND COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Tolland	91	68
Andover	44	40
Bolton	53	41
Coventry	232	199
Columbia	105	81
Ellington	119	98
Hebron	109	82
Mansfield	192	150
Somers	163	133
Stafford	499	372
Union	64	39
Vernon	847	570
Willington	159	120
Total	2,677	1,993

NEW HAVEN COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
New Haven	8,264	5,999
Branford	446	284
Bethany	68	46
Beacon Falls	57	49
Cheshire	266	215
Derby	1,496	1,105
East Haven	105	69
Guilford	359	250
Hamden	404	310
Madison	176	118
Meriden	2,513	1,957
Middlebury	66	48
Milford	374	264
Naugatuck	652	490
North Branford	130	88
North Haven	224	162
Orange	357	252
Oxford	133	110
Prospect	56	43
Seymour	253	202
Southbury	142	114
Wallingford	670	374
Waterbury	2,729	1,688
Woodbridge	86	65
Wolcott	58	50
Total	20,084	14,352

MIDDLESEX COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Middletown	1,243	771
Chatham	231	182
Chester	156	122
Clinton	169	104
Cromwell	181	139
Durham	104	62
East Haddam	363	299
Essex	257	162
Haddam	232	176
Killingworth	105	78
Middlefield	106	90
Old Saybrook	85	69
Portland	330	258
Saybrook	199	155
Westbrook	111	81
Total	3,872	2,748

NEW LONDON COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
New London	1,442	770
Norwich	2,398	1,521
Bozrah	79	66
Colchester	351	310
East Lyme	168	131
Franklin	55	40
Griswold	342	230
Groton	570	365
Lebanon	218	179
Ledyard	186	154
Lisbon	73	66
Lyme	144	116
Montville	364	296
North Stonington	236	185
Old Lyme	163	128
Preston	352	198
Salem	60	52
Stonington	809	485
Sprague	173	100
Voluntown	118	79
Waterford	295	211
Total	8,596	5,682

WINDHAM COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Windham	975	613
Ashford	136	96
Brooklyn	170	135
Canterbury	117	83
Chaplin	48	33
Eastford	89	74
Hampton	96	77
Killingly	766	463
Plainfield	368	288
Pomfret	158	110
Putnam	490	295
Sterling	93	74
Scotland	59	50
Thompson	315	236
Woodstock	280	205
Total	4,160	2,832

FAIRFIELD COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Fairfield	373	285
Bethel	490	287
Bridgeport	4,526	3,094
Brookfield	112	97
Danbury	1,437	763
Darien	220	152
Easton	124	96
Greenwich	822	638
Huntington	365	241
Monroe	109	82
New Canaan	287	199
Newtown	308	254
New Fairfield	79	64
Norwalk	1,525	831
Redding	175	133
Ridgefield	216	162
Stamford	1,384	798
Stratford	458	286
Sherman	83	75
Trumbull	141	101
Weston	83	70
Westport	389	290
Wilton	170	129
Total	13,876	9,127

LITCHFIELD COUNTY.

TOWNS.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Litchfield	430	303
Barkhamsted	136	93
Bethlehem	81	62
Bridgewater	83	66
Canaan	145	99
Colebrook	129	113
Cornwall	172	142
Goshen	102	81
Harwinton	88	61
Kent	131	113
Morris	71	61
New Hartford	370	293
New Milford	500	386
Norfolk	126	107
North Canaan	176	154
Plymouth	377	274
Roxbury	102	91
Salisbury	407	259
Sharon	296	235
Torrington	583	410
Thomaston	352	228
Washington	214	165
Warren	87	64
Watertown	241	189
Winchester	920	625
Woodbury	253	206
Total	6,572	4,880

RECAPITULATION BY COUNTIES.

COUNTIES.	Inactive Militia.	No. of persons assessed Commutation tax of $2.
Hartford	15,911	10,662
Tolland	2,677	1,993
New Haven	20,084	14,352
Middlesex	3 872	2,748
New London	8,596	5,682
Windham	4,160	2,832
Fairfield	13,876	9,127
Litchfield	6,572	4,880
Total	75,748	52,276

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REPORT OF BRIGADIER-GENERAL STEPHEN R. SMITH, COMMANDING BRIGADE C. N. G.

BRIGADE HEADQUARTERS, C. N. G.,
NEW HAVEN, December 1. 1883.

Brigadier-General DARIUS N. COUCH,
Adjutant General State of Connecticut:—

GENERAL:

In compliance with the provisions of the Militia Law of the State, and orders of the Commander-in-Chief, I have the honor to report that the several organizations of the Connecticut National Guard held their Spring Parades during the month of May, and under the direction of the Commanding Officer of the Regiment, Battalion or Battery, or an officer detailed by him for the purpose, devoted an entire day to rifle practice, inspection and drill. Detailed reports of these parades, which were generally creditable and satisfactory, were duly transmitted.

The entire military force of the State, consisting of the First, Second, Third and Fourth Regiments, Fifth Battalion, and the Artillery, for the first time since the Centennial Encampment at Philadelphia in 1876, was encamped upon the State grounds at Niantic, September 10 to 15, inclusive, the camp this year being named "Camp Waller," in honor of our distinguished Governor and Commander-in-Chief. This encampment again proved that the force itself, in its material and drill, is an efficient, well-disciplined and orderly corps, and creditable to the Commonwealth which it is organized to defend. The results also again demonstrated the wisdom of the Legislature in enacting the law providing for these annual encampments, and the entire feasibility of requiring a full attendance, enforcing discipline, and securing good work under its wholesome provisions.

This encampment I intended should be strictly a camp of instruction, and prescribed the following hours of service and roll-call for the daily routine duty:

Reveille		6.00 A. M.
Surgeon's Call		6.30 A. M.
Breakfast		6.45 A. M.
Police Call		7.00 A. M.
Company Drill	7 30 to	8.15 A. M.
Guard Mounting		9.00 A. M.
Battalion Drill	10.00 to	11.30 A. M.
Dinner		12.00 M.
Battalion Drill	2.00 to	3.00 P. M.
Police Call		4.00 P. M.
Brigade Dress Parade		5.00 P. M.
Supper		6.00 P. M.
Tattoo		10.00 P. M.
Taps		10.30 P. M.

Both officers and men yielded ready and cheerful obedience in all the duties imposed upon them by this order, and also willingly performed other special and severe duty, which I had occasion frequently to call upon them for.

There having been no changes in the roster of commanding officers of the Brigade since the last encampment, the Battalion drills were uniformly good and well conducted, and the desire upon the part of the field and line officers to increase their knowledge of the tactics by the closest attention, was manifestly as great as at the encampment of 1882. In fact, too much praise cannot be awarded the veteran Colonels, Tubbs, Barbour, Graham and Crofut, for the very able manner in which they conducted all the drills of their several commands. I will not speak in detail of these drills or make comparisons, but will say briefly, that under the circumstances peculiar to each, I was well satisfied with the work of them all.

While the military efficiency of the line officers has very perceptibly improved during the past year as a whole, it is not, in a few cases, what it ought to be. Neither is it what we have a right confidently to expect in the future. Some officers, notably of companies located singly in places outside of cities, where observation and comparisons cannot be made, seem to be satisfied with just enough knowledge of the tactics to enable them to drill their commands in the simplest movements possible only in small armories, and therefore when called upon to command their companies on Battalion drill in the field, realize by their ignorance the value of their lost opportunities.

There are other officers, for many years occupying the same positions in the service, who seem to be satisfied with their present standard, and consequently neither study nor exhibit any ambition to

know anything beyond the routine of the particular grade in which they are serving. When the test is applied, whether of examination for promotion or fitness for special duty in a sudden emergency, they will be found wanting.

The Fifth Battalion, for the first time since its organization, went into camp with the Brigade, and of the beneficial results of the encampment to them too much can scarcely be said. The close and careful attention to all orders, whether for routine or special duty, and the good order and strict observance of military courtesy, was quite remarkable for such a new organization. The improvement in drill and discipline, as shown at the close of the week, clearly proves beyond all question the propriety of establishing encampment duties for them as well as for the other State troops. Special commendation is due to Major Welch for his able and successful efforts to promote the welfare of his command.

The drill of the First Regiment under Colonel Barbour in street riot formation and street firing, on an excellent system devised by Brigadier General W. H. Brownell, of Brooklyn, commander of Fourth Brigade, National Guard, State of New York, was very thorough and attracted much attention. As Upton's Tactics are silent on this important matter, any effort on the part of officers to drill their commands under any system prepared for emergencies requiring street firing, is deserving of encouragement and praise.

The special words of commendation of the drill, evolutions and conduct of the officers and men of Battery A, I have had occasion for several years to speak, may be justly repeated in this year's report. Their hard work at drill and steadiness at ceremonies was very commendable. In my opinion the time has now come when this organization should be furnished with new Battery equipments, particularly with new harnesses, for certainly the latter are unfit for use, and would be instantly condemned if the Battery was ordered into the United States service. I would recommend that better armory accommodations be furnished the Guilford Platoon, the present building being insufficient for their wants.

I think it may be truly said that the guard duty at Camp Waller was better performed than at any former encampment. The plan of posting the guards was changed this year, so that the details from each command should be required to cover only a certain prescribed distance, and that the sentinels might be instructed in their duties by their own officers. The several guards were mounted regimentally, and were then established and otherwise directed by a Field Officer of

the Day. This change worked well in that the regimental officers of the day could be held responsible for the instruction and efficiency of sentinels, and resulted in the performance of this duty with much strictness and attention to detail, increasing toward the close.

The policing and sanitary condition of the camp were excellent, and the health of the command good, the sickness being slight in character, extending to a very small percentage of the numbers present. For a detailed statement regarding this sickness and the causes of the same, I refer you to the accompanying report of Lieutenant-Colonel Carleton, Medical Director of the Brigade.

The usual orders prohibiting the sale of intoxicating liquors within one mile of camp were issued in accordance with Section 4, Chapter 5 of the Militia Law, and I am happy to say that they were very generally obeyed.

The deportment of the men when off duty, in the village of Niantic, was gentlemanly and quite satisfactory to myself, as well as to the inhabitants, who frequently so assured me. An occasional complaint reached me, but in every instance, after a prompt investigation, the trouble was found to be caused by camp followers and not by members of the Guard. More or less straggling at night occurred during the week, but it was mostly done by recruits. The watchfulness and zeal of Major Clapp, of the Brigade staff, who commanded the Provost Guard, was a standing menace to all who contemplated such business, and at the latter part of the week the straggling almost entirely ceased.

The camp was regularly laid out and tents pitched by Quartermaster-General McManus, and presented the finest appearance of any military camp ever before located in this State. Great credit is due to him, as well as to Lieutenant-Colonel J. L. Woodbridge, Assistant Quartermaster-General, who so ably carried out his careful and judicious instructions. When turned over to me on the morning of the 10th, it was a model of neatness and regularity, and the officers of the Brigade were unanimous in its praise.

The grounds at Niantic, now owned by the State, are admirable for camp purposes, but were again found to be too limited in area; and I must therefore repeat my recommendation of last year that the Quartermaster-General be authorized to purchase a few acres of land on the easterly end of the field, which I learn can be bought at a very moderate price. This tract of land we have been compelled to lease for several encampments, and I think it would be well for the State to own it, so it can be graded and otherwise improved.

During the past year great improvement in the drill and instruction of the Signal Corps was clearly evidenced, and upon many occasions during the encampment week the w rk called for was executed with the greatest satisfaction. In directing the movements of the different battalions upon the field day at Flanders, their services were found indispensable. Besides this field duty, the corps, under the direction of Major Charles L. Burdett, Engineer and Chief Signal officer, maintained signal stations in the camp and village; erected telephone lines between important points, besides surveying in and about the camp, telegraphing, etc., etc.

The usual review by the Governor and Commander-in-Chief occurred on Friday, the 14th, and was an exceptionally fine affair. Besides the review and dress parade, the several commands were afforded an opportunity to exhibit their efficiency in drill separately, which was accomplished to the satisfaction of all present. The volley and file firing of the different battalions was an interesting feature of the exhibition.

The operations of the week were varied by three pleasant diversions, which added very much to the interest felt by officers and men in our voluntary service.

The first of these was a series of maneuvers in the woods and upon the rocks and hills of the back country, by the Second and Fourth regiments, each accompanied by a platoon of artillery, the commands being arrayed against each other as hostiles. These maneuvers (directed from Brigade Headquarters by aid of the Signal Corps), and the firing of the skirmishers, the battalions, and the artillery, the latter from positions on hills and rocks seemingly impossible to occupy, were witnessed by the rest of the Brigade, and created great enthusiasm, making all eager to engage in the more elaborate field movements of the entire Brigade, projected and announced to take place upon the following day.

The second was a review of the Brigade by Quartermaster-General McManus. The day being stormy the entire command was paraded in overcoats, blouses and fatigue caps, instead of in the customary ceremonious full dress. This compliment to General McManus was tendered in recognition and appreciation of his earnest and constant efforts to insure and increase the comfort of the men both in and out of camp with all the facilities of the Quartermaster's Department. This review was the most soldierly, if not the finest spectacle of the week.

The third was a field day at Flanders. Early in the year you ex-

pressed to me a desire that the Brigade at the fall encampment should be given an opportunity to test their ability to make long marches over rough country roads, and to otherwise show their efficiency in those maneuvers that they would naturally be required to perform should the State call them into active service, and it was therefore determined that a day should be devoted to such field exercises.

Accompanied by the Brigade Engineer I reconnoitred the country in the vicinity of the camp ground, within a radius of about five miles, to find a suitable field of operations.

The camp ground is located upon the west bank of the Niantic river, near its mouth. About three miles above the camp the river turns to the east from its main course, and flows through a ravine between the hills, which rise from the banks to the height of about one hundred feet. These hills rise abruptly for about two miles below the bend, and then broad table lands and meadows intervene between the river and the foot hills. At this east and west reach of the river a cove, called the "head of the river," is formed, and in this immediate vicinity, on and near the main road from New London to Lyme, is the locality that was selected as the field of operations, and shown on the map submitted herewith.

On the west side of the river the road from the camp leads to the west about a mile, and then turns to the north, following the valley of the river next west of the Niantic, and along the foot of the western slope of the Oswegatchie hills. The main road to New London is reached about four miles north of Niantic, and in the village of Flanders.

In order to give the larger part of the Brigade instructions in attack formation, I selected the Third Regiment for the duty of defending the main road at the ravine and on the western slope of the hill (Fort Hill) on the east of the cove, the idea being that they were resisting the attempt of the enemy (represented by the First, Second and Fourth Regiments, Fifth Battalion and the Artillery) to march to and attack New London.

The Third Regiment was supposed to have marched out from New London and to have met the enemy just as the head of their column emerged from the ravine west of the cove, and, after a sharp skirmish, to have been driven back to the position along the crest of Fort Hill, where they were finally defeated by the superior numbers of the enemy.

The Brigade left the camp about 9 o'clock on Thursday morning, September 13, in a rain storm, and marched along the route already

indicated, the column being formed with advance guard, rear guard, and flanking parties, the men at route step, and the wagons of the field train with the main body. Ambulances, with an ample supply of stretchers for possible use, were provided, and the medical department was thoroughly organized, as if for service.

For about a mile and a half the Third Regiment acted as advanced guard of the Brigade, and then they were detached while the column was halted, and given thirteen minutes' time to enable them to take their position beyond the river in advance of the arrival of the column.

The march was resumed, and the firing began at 11 A.M., when advanced guards of the Third Regiment were discovered by those of the Brigade.

The action which immediately followed, and in which the entire Brigade was engaged, continued for one hour and forty-one minutes, and terminated according to orders promulgated previously, and upon the field.

After an hour for lunch, the return march was made by way of the road leading along the east bank of the Niantic River, across the bridge at its mouth, and then on through the village to the camp, which was reached at 3.39 P. M. The whole distance covered by the Brigade on the march was about ten miles, and the time occupied six hours and three-quarters.

For two days previously the weather had been thick and lowery, with heavy mist and occasional severe showers that filled the brooks and marshy places, and made the roads heavy and muddy, while on Thursday morning light rains and cloudy skies again threatened a postponement of my plans for the day's maneuvers. After carefully considering the matter, and knowing that the men were amply equipped with overcoats and other warm clothing, I decided to carry out the plan for the field exercises as arranged, and ordered the march, the weather on Thursday having caused a delay of only one hour. The men behaved admirably on the march; ranks being well kept, with no foraging and scarcely any straggling, and all waded good-naturedly along the muddy roads.

One company of the First Regiment, when ordered to drive the skirmishers of the Third from their first position in woods south of the cove, made the attack through thickets and across a marsh which wetted them to the waist, but they rushed through, regardless of personal comfort, and rendered safe from flank attack the approaching main column in its passage along the main road. Like instances of

prompt obedience and soldierly conduct were noticed in other companies in the Brigade. The day passed without accident to the infantry, and with none in the Brigade that could be directly attributed to the exercises. The unfortunate accident to Private Richard H. Clark, of the Clinton Platoon of Battery A, was caused by the premature discharge of the piece as he was ramming home the charge. This is an accident only too common where muzzle-loading guns are fired by the militia on any occasion.

All the battalions were remarkably well handled, the commanding officers, by their ready comprehension of orders communicated to them on the field by staff officers or the signal corps, and their prompt compliance, made all my plans for the day's work a complete success. The artillery was especially well handled, the guns being taken through thickets and over walls, to gain commanding positions where they could be accurately and well served. The experience gained by the Second and Fourth Regiments and the artillery, in their field movements and mimic engagement of the 11th, and that of the First Regiment in their spring parade days of this and last year, which they voluntarily devoted to similar duty, was of great benefit on this occasion. The Third Regiment, upon whom devolved the defense of New London, and the unpleasant duty of being defeated, was selected because New London was in their district, and its defense would more naturally fall upon them than upon any other of the State troops. The value of such practical lessons to the National Guard of this State cannot be over-estimated, and I trust similar plans, made more elaborate, with experience and increased knowledge of field service, will be demanded and executed at every encampment for many years to come.

The Brigade having received an urgent invitation from the "Committee on the Celebration of the One-Hundredth Anniversary of the Evacuation of the City of New York by the British," to take part in the parade and ceremonies attending the celebration of this historical event, and many of the commands expressing a patriotic desire to accept it, I had the honor to ask permission of the Commander-in-Chief to parade the Brigade in New York city upon November 26, the date of the occasion referred to, which permission was very cordially granted. Though the invitation reached us at a very late day, I at once laid it before the several commanding officers, for their consideration and official decision, and I am pleased to report that the entire Brigade, with the exception of seven companies, voted to make the parade, which they eventually did, and at no expense to the State, each individual participating bearing his own. The Brigade was

assigned a very prominent position in the line, which was about five miles in length, and comprised nearly fifty thousand persons. The parade was made under the most unfavorable conditions of weather, the rain descending in torrents during the entire day, and the streets being very muddy and slippery. Still I am happy to say that the marching of the men was excellent, and received hearty and continuous applause all along the route from the million or more of interested spectators. We were specially commended by the people, as well as by the press, for the solid and soldierly appearance presented, caused by our wearing the serviceable overcoat and fatigue cap, instead of the full dress uniformly worn on such parades of ceremony. Receptions, collations and courtesies of every description were lavished upon us by the Committee of Arrangements, the military of New York, and the citizens generally; and, while the discomforts were many, I have yet to learn of a single officer, or man, who regrets making the trip; on the contrary, I believe they are glad they had the opportunity to carry the good name of our Brigade into another State, and to uphold it so efficiently and honorably.

I desire to award credit to Colonels Graham and Crofut, and Major Welch, of the Second and Fourth Regiments, and Fifth Battalion, respectively, for the excellent work they performed in so promptly getting their commands in readiness, and special credit to Colonel Tubbs, of the Third Regiment, and Captain Lee and Lieutenant Fowler, of Battery A, whose personal efforts at the last moment alone gave us the presence also of their commands. The only regret and damper upon the perfect success of the day, aside from the weather, was the unavoidable absence of Company I, of the Fourth Regiment, and seven companies of the First Regiment. This latter regiment, however, was represented by Company F, Captain Charles E. Thompson, which appeared in large numbers, escorting the Field and Line officers, and again by their marching and deportment, added to the laurels won upon the Yorktown and Charleston excursion, now memorable in history. The Second Company Governor's Foot Guard, of New Haven, Captain E. J. Morse, accepted my invitation to accompany the Brigade, and by the courtesy of Colonel Graham, paraded as the eleventh company of the Second Regiment. This is a first-class military company, and would honor the National Guard if admitted to membership, and as I understand that they are ready and willing, I would suggest that they be admitted immediately.

We were greatly indebted to the officers of the New York, New Haven and Hartford Railroad Company, for their active co-operation

and hearty assistance in furnishing comfortable and rapid transportation, at satisfactory rates, to the troops passing over their several lines upon this occasion; and are also indebted to Superintendent O. M. Shepard for his skillful management of trains upon the Shore Line Railway, by which the troops were transported to and from camp so promptly and satisfactorily.

The duties devolving upon the Brigade Staff during the encampment required constant and difficult labor, but it affords me pleasure to say that they were discharged in a very intelligent and creditable manner. The remarkable promptness with which the Brigade was formed for drills, dress parades and reviews reflected great credit upon Lieutenant-Colonel L. L. Morgan, Assistant Adjutant-General, for his skill as a soldier and tactician. Major T. L. Watson, in his trying position of Quartermaster, performed his duties to the Brigade with his usual fidelity. Majors Spencer and Hayden, besides attending to their respective departments, were ever ready to undertake any special duty, however arduous. Captains Stevenson and Stratton, Aides-de-camp (the latter officer appearing with the staff for the first time), by their gentlemanly and soldierly deportment, fully sustained their usual reputation as rigid, critical and experienced soldiers. Sergeants Osborn and Norton, as Orderlies and Headquarter Clerks, performed their duties well and satisfactorily.

It is probable that the Board appointed to prepare a Code of Regulations for the National Guard of the State will be able to complete their labors within the next three months.

Herewith I have the honor to transmit reports of Lieutenant-Colonel Charles M. Carleton, Medical Director, and Major Charles L. Burdett, Engineer and Chief Signal Officer, marked A and B, and the annual report of Major Fred. A. Spencer, Inspector of Rifle Practice.

In closing, please allow me to allude to the universal courtesy I have ever received from yourself, in all our official intercourse, and to express my due appreciation of the same.

Very respectfully, your obedient servant,

STEPHEN R. SMITH,

Brigadier-General Commanding C. N. G.

[A]

Report of Brigade Medical Director.

NORWICH, November 2, 1883.

General S. R. SMITH,
Commanding Connecticut National Guard:—

GENERAL :

In obedience to your orders I have the honor to report :

That the principal diseases treated at Camp Waller were as follows : Diarrhœa, caused by indiscretions in eating, change of water and diet ; and colds, caused by tent life in unusually unfavorable weather.

That during the encampment there was excused and sent home but one man, who was ill with simple continued fever, from some unascertained cause, and that none were sick at the time of breaking camp.

That the sanitary condition of the camp was perfect, and the good health of the troops, under the unaccustomed circumstances of fatigue and exposure, during a week of unusual inclemency, was remarkable and unparalleled.

This must be attributed, not only to rigid sanitary requirements, and excellent sanitary conditions, but to the watchfulness, fidelity and efficiency of the medical officers of the several battalions.

In conclusion, permit me to say that my experience in camp, and my knowledge of the acquirements of the gentlemen to whom such rare results are due, leave me no room to doubt that the medical department of your command is equal to any emergency which, individually or collectively, the exigencies of the service can ever cause it to face.

I also have the honor to report that the only casualty occuring in the line of duty, at Camp Waller, was as follows :

Richard H. Clark, private, Second Platoon, Battery A, injury to right hand and fore-arm, by the premature discharge of one of the guns of the battery.

I established a temporary hospital at the Morton House, near the camp, to which he was removed by the ambulance corps, and where the injured arm was amputated, between three and four inches below the elbow-joint, by Lieutenant W. C. Burke, Jr., Assistant Surgeon

Fourth Regiment, assisted by Major C. Purdy Lindsley, Surgeon of the Second Regiment, under the supervision of Surgeon-General E. L. Bissell.

Private Clark was subsequently removed to the State hospital at New Haven, from which he was afterwards discharged, having made a good recovery.

I am, very respectfully, your obedient servant,

CHAS. M. CARLETON,

Medical Director C. N. G.

[B]

Report of Brigade Engineer and Signal Officer.

HARTFORD, CONN., September 20, 1883.

Brig.-General S. R. SMITH,

Commanding Connecticut National Guard:

GENERAL:

In accordance with your orders I have the honor to submit the following report on the brigade field exercises of September 13, 1883, and the accompanying map of the field of operations.

As a result of the reconnoisance of the country within a radius of five miles from the State camp ground, a plan for a day's exercise was arranged upon the following

IDEA.

An attack on the city of New London is contemplated by an armed force of infantry and artillery, which is supposed to have landed at the mouth of Connecticut river, and, protecting its rear by destroying the bridge and cutting the telegraph wires at Lyme, is on the march towards New London on the main highway between the places named.

Warned by the flames of the burning bridge and by scouts who bring the news of the enemy's approach, the Third Regiment C. N. G.

is quickly assembled at New London and marches to the westward to meet, and, if possible, destroy the enemy.

The advance guards of these opposing forces meet at the cove at the "head" of Niantic river, in the village of Flanders, and, after a sharp skirmish, the Third Regiment fall back and occupy the crest of the hill just east of the river.

The column of the enemy are thus enabled to emerge from the defile and to deploy in line of battle along the river bank, and, after a stubborn resistance on their part, to defeat and capture the defending force.

ITS APPLICATION.

At 8.57, on the morning of September 13, the brigade began the march from camp, and took up the route along the road to the west at route step, with the Third Regiment as advance guard, the Fifth Battalion as rear guard, and with flanking parties where the topography of the country favored their use.

It was raining when the march began, and the roads were muddy and heavy from the rain of the previous day, so that the progress was slow, it taking twenty minutes to each mile covered. Rests were taken at intervals of a mile, and the engagements began at 11 a. m., at four and one-quarter miles from camp.

At 9.44 the Third Regiment were sent ahead and allowed thirteen minutes in which to gain a lead sufficient to enable them to act the part assigned to them and to gain the proper position for defense in advance of the brigade.

[When used hereafter the term brigade will mean all except the Third Regiment, and will be supposed to denote the hostile force.]

The First Regiment was then detached as advance guard, and the brigade resumed the march along the road taken by the Third Regiment.

At four miles from camp the brigade reached the main highway between Lyme and New London, and followed it towards the east, crossing the Niantic river, and entering a defile with a steep wooded hill on their left, and on their right the river, just south of the road, with the hill rising beyond.

While thus situated (see map following page 52) they were fired upon by the advance guard of the Third Regiment, and halted.

After a brief reconnoisance it was found that the Third Regiment was in position on the crest of the hill where the main road crossed the northerly extremity of Oswegatchie Hill as it descends towards

the cove at the head of the river. The road forks just before the first bridge is reached, and their right wing held the north branch on the north side of the cove, their center with a section of the battery holding the main road, and the left of their line extending along the wooded slope of the hill south of the road, with a swamp and the river in their front.

FIRST STAGE.

The First Regiment was ordered to dislodge the enemy, and a platoon of the artillery opened fire from a reconnoitering position, just north of the fork of the road, sheltered by an orchard and wall. Three companies of the First deployed across the main road, and five companies moved along the road north of the cove.

The single piece of artillery accompanying the Third Regiment was soon silenced and withdrawn, and a few case shot demoralized their left wing so that company B, First Regiment, was enabled to push across the river by a foot bridge, and through the swamp and thicket into the woods beyond. Their left being turned, the Third Regiment fell back along the main road, stubbornly contesting the way, and made a second stand on the first bank east of the Niantic river. The pursuit had been so sharp that they were unable to destroy the iron bridge over the main river, and two companies of the First followed across the river. Unable to push the enemy further, one of these companies moved to the north along the road on the bank of the cove, and threatened to cut off the right wing of the Third Regiment that was resisting the progress of the main body of the First Regiment along the northerly road. Quickly seeing the danger of his position, the Lieutenant-Colonel commanding this wing retreated rapidly, but in good order, across the brook, and rejoined the regiment, a part of which held a position along the bank and in line between the corn fields shown on the map, while the main body were forming in the "final position."

SECOND STAGE.

The brigade moved forward out of the defile, and the Second Regiment was deployed across the main road to north and south as soon as the river was passed.

The skirmishers of the Third Regiment were driven back across the fields that are cut by the beds of brooks and intersected by stone walls at frequent intervals, and the brigade line of battle was

extended on the right by the Fourth Regiment, with the Fifth Battalion in reserve, and on the left by two companies of the First Regiment, the rest being in support on the center and in reserve on the left flank.

Fire was opened along the line, one platoon of artillery being on the prolongation of the line to the left and one section in the rear, west of the river, and the line was then pushed forward as far as possible.

The Third Regiment held the crest of the hill back of stone walls, and hastily formed intrenchments; covered with a destructive fire the whole hillside, that was obstructed by bushes, fences and stone walls, and held the brigade at about 200 yards off with an open space between that could be crossed only at a great loss of life. The main road was effectually held, and the left wing commanded, and rendered impassible the river road that leads to the south along the Niantic river, and thence to New London.

THIRD STAGE.

Under orders from the General in command, the fighting line of the brigade was reinforced on the right by the Fifth Battalion, strengthened on the center by the support, and a portion of the reserve placed as if to turn the left flank of the Third Regiment, and a heavy fire concentrated on their left wing. In the meantime, three companies of the First Regiment, and a platoon of artillery, had moved along the northerly road (as indicated by the broken line on the map), and had gained the woods beyond, and slightly to the rear of the right wing of the Third Regiment.

As soon as fire was opened from these woods, the brigade pushed rapidly forward their left and center; pierced the center of the Third's position, and captured their right wing, at 12.10.

This practically ended the engagement that had lasted an hour and ten minutes; but, in order to still further extend the practice, after a short parley, the Third Regiment re-formed in the woods south and east of the buckwheat field.

The brigade moved against this last position, the artillery shelling the woods, and fire was continued until the ammunition was exhausted, at 12.41, when the companies were withdrawn, and the regiments re-formed.

THE RETURN.

At 1:45, the brigade started on the return march along the road on the east side of Niantic river, and reached the camp ground at 3.39, having marched about ten miles during the day, and been absent from camp for six hours and forty-two minutes.

The accompanying map shows the field of operations in the vicinity of Flanders, and the several positions occupied by the contending forces.

In making the surveys on which the map is based, I was aided by Lieutenant T. W. Gleason, Signal Officer First Regiment.

Respectfully submitted,

CHAS. L. BURDETT,

Major and Engineer and Signal Officer, C. N. G.

N
W
E
Flanders
to Groton
5th battn
4th regt
2d regt
Brigade rear Column
First position 3d Brigade
First position 3d
1st regt
3d regt
corn
1st regt
2d regt
3d regt
Final position 3d regt.
battery
corn
Pumpkin River
5th battn
4th regt
3d battn
buckwheat
to New London
Map
illustrating
Field Day Operations
near
Flanders. Conn.
to accompany report to
Brig. Gen: S. R. Smith.
commanding
Conn. Nat. Guard.
Sept – 1883.
Scale of yards.
100. 200. 300. 400. 500.
Notes:
Position of 3d Regt denoted by
" " Brigade " "
" " Skirmishers " "
C. L. B.

[7]

REPORTS OF OFFICERS REGARDING MILITARY DUTIES.

Report of Col. Lucius A. Barbour Concerning Spring Parade First Regiment C. N. G., May 16, 1883.

HEADQUARTERS FIRST REGIMENT C. N. G.,
HARTFORD, Conn., May 17, 1883.

Brigadier-General D. N. COUCH,
Adjutant-General:—

GENERAL:

In accordance with General Orders No. 8 and Special Orders No. 33, A. G. O. c. s., I have the honor to make the following report: The regiment, being directed by you to be exercised in field maneuvers, was ordered to assemble at Hartford, Conn., on Wednesday, May 16, in fatigue uniform, with one day's rations. At 8.45 o'clock line was formed in Union Armory, and a short drill, preparatory to the movements to be executed on the street, was held. The line of march was then taken up, through Elm and Trinity streets, Capitol avenue, Main and Charter Oak streets, to the Franklin range. On Capitol avenue the regiment was marched in the "flanked column order," being a disposition in the form of an elastic oblong, varying with the width of different streets, and adopted as a maneuver of safety in marching through a locality supposed to be unfriendly to the presence of troops. The field staff, non-commissioned staff, music and colors were placed in the center of the oblong, and the battalion, with companies on the flank, in column of fours, occupied the entire street and sidewalks. On Charter Oak street a disposition known as the "Street Riot Order" was made, the leading division at intersecting streets, turning quickly to the right and left, covered the passage of the battalion, and separated the opposing forces, the whole column being protected by sharpshooters. These movements were prepared by General W. H. Brownell, now commanding Fourth

Brigade N. G. S. N. Y., for the Forty-seventh Regiment, when he was its colonel, and possess many excellent features for maneuvering a battalion during civic irregularities. They were very well performed, although never before attempted with the entire battalion. Officers and men took great interest in carrying out the details of the movements. After leaving Charter Oak street the regiment was marched in route step, and arrived at the range at 10 o'clock, where it was immediately mustered by me, with the following result:

	Present.	Absent.	Total.
Company A	51	4	55
Company B	60	2	62
Company D	53	3	56
Company E	52	9	61
Company F	51	9	60
Company G	50	11	61
Company H	45	8	53
Company K	53	13	66
	415	59	474

Only 2 officers were absent, both being reported out of the State, and 57 enlisted men, a percentage of 87½. The range was opened for fourth-class practice at 8 o'clock A. M., and details from the Hartford companies were ordered to report to the Inspector of Rifle Practice at that hour. As each company was mustered, details for target practice were made, and the remainder directed to drill in company skirmish drill until 12 o'clock. Owing to the excellent arrangements at the firing point, under charge of the Inspector of Rifle Practice Crane and Adjutant Williams, 94 men were practiced at 100 yards, of whom 56 qualified as follows:

	No. Practiced at 100 Yards.	No. Qualified at 100 Yards.
A	13	3
B	6	3
D	21	16
E	15	6
F	8	7
G	20	11
H	3	3
K	8	7
	94	56

The range was closed at 1 o'clock. But 28 men remain in the fifth class, 22 being from one company (E), and these were not practiced, owing to a misunderstanding of the orders directing them to report. The company drills were carefully attended to, and instruction given in matters difficult to accomplish in armories.

The Signal Corps were exercised in sending and receiving messages, and appear to be in an extremely serviceable condition.

At 1.30 P. M. the regiment re-formed for field maneuvers, and were exercised upon the following idea:

THE TACTICS OF INFANTRY IN BATTLE.

Two parallel columns advance to the south under cover of advanced guards and flankers. The left column is attacked in flank and retires upon the right (or main) column, being protected in the movement by its advance guard.

A fighting line of skirmishers is deployed and advances against the enemy. Being flanked, the support strengthen and extend the line to oppose the movement, and gradually draw nearer the enemy. The reserve being at last ordered into the line, a rush is made upon the enemy's position. To mark the line of a supposed enemy, a detail of 20 men for special duty is made, and posted in groups along a front of 1,200 yards, with directions to gradually increase the front of fire, to indicate an extending force. This detail left the ground in advance of the regiment, and were placed in position without their absence from the main body being generally noticed.

The right wing, under my immediate command, pursued the westerly of two nearly parallel roads, while the left wing, under command of Lieutenant-Colonel Cone, followed the easterly road.

A report of the proceedings from this point, until the close of the maneuvers, has been prepared, with an accompanying map, by Acting Engineer and Signal Officer Burdett, and is herewith made a part of this report (marked A).

At the close of the field maneuvers the regiment was marched in route step back to the Franklin range, and, after a brief halt, returned to the city, marching through Charter Oak, Main, Church, High and Ford streets to the East park, where dress parade was given; the Hartford companies, after dismissal, marching into the Armory, under command of the First Sergeants, and the out-of-town companies returned to the depot. The street and dress parades were very satisfactorily performed, as were all of the duties of the day.

The field, staff and non-commissioned staff officers volunteered their services without expense to the State; those whose duties required it were mounted. But three staff officers were absent, it being unavoidable in each case.

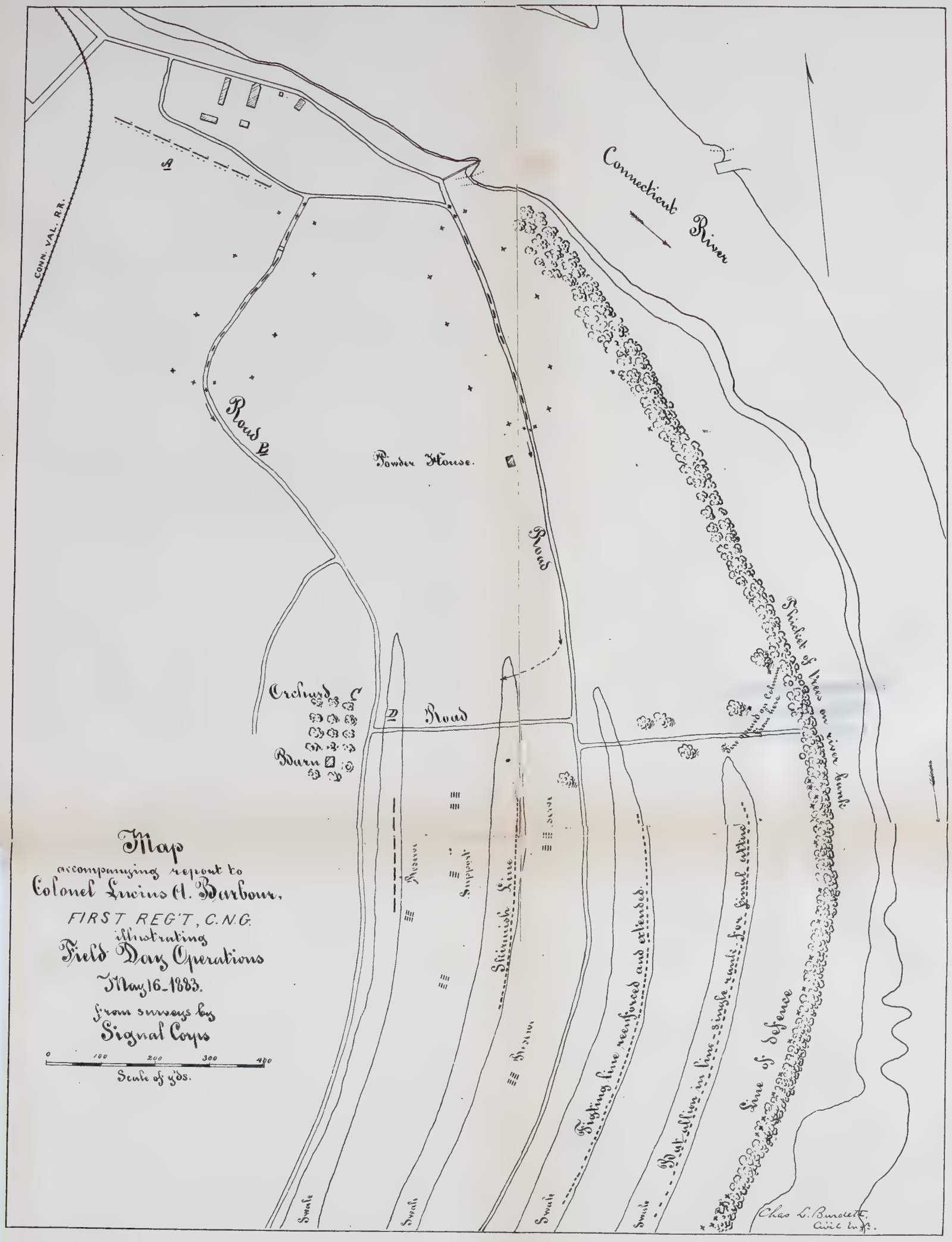
The instruction given to the regiment by the field maneuvers of this year and of 1882 have been of great benefit to the members, and, in my judgment, were days profitably spent. Great interest in the movements was observed, and this year the element of uncertainty entered more largely into the plans, but very few of the officers being made acquainted with the proposed operations.

I am again under great obligations to Corporal Charles L. Burdett, Co. K, who was detailed by me as Acting Engineer and Signal Officer, for his co-operation in preparing the plans for the maneuvers and his assistance as a staff officer during the day.

Very respectfully your obedient servant,

LUCIUS A. BARBOUR,

Colonel First Regiment C. N. G.



Map

accompanying report to

Colonel Lucius A. Barbour,

FIRST REG'T, C.N.G.

illustrating

Field Day Operations

May 16–1883.

from surveys by

Signal Corps

0 100 200 300 400

Scale of yds.

[A]

Report of Acting Engineer and Signal Officer Charles L. Burdett on Field Maneuvers First Regiment C. N. G., May 16, 1883, with accompanying Map.

HARTFORD, CONN., May 17, 1883.

Colonel LUCIUS A. BARBOUR,
Commanding First Regiment, C. N. G.:—

COLONEL:

I have the honor to submit the following report of the field operations of the First Regiment on the afternoon of field day, May 16, 1883, with accompanying map.

The map shows, on a scale of 400 feet to the inch, a portion of the South meadows situated about two miles southeast of Hartford City Hall.

The soil at this place is of alluvial formation, mostly sand, and one that dries rapidly after rain.

For a width of 1,000 yards from the river bank, and for a distance of a mile and a half to north and south, the meadows are comparatively free of trees, and the surface of the ground, mostly grass land, is slightly rolling and cut by swales or hollows extending north and south in parallel lines at intervals of about 150 yards, and is crossed by several cart paths.

Referring to the map, the regiment is shown at *A* in columns of fours at the northern extremities of the meadows, and at this point two equal columns were formed, one under the command of the Colonel and the other under the Lieutenant-Colonel.

1.30.—At about 1.30 P. M. the right column, under the command of Colonel Barbour, advanced in columns of fours with advanced guard, rear guard and flanking parties, on the westerly road *B*, leading south past the barn and orchard *C*, and the left, under Lieutenant-Colonel Cone, marched in same order by the easterly road, passing just east of the brick powder house.

1.45.—At about 500 yards south of the powder house, the advance

guard of the left column was fired upon from the woods at their left, and at once moved to the west covered by the advanced guard formed in skirmish line, and joined the column under Colonel Barbour at the cross road *D*.

1.52.—The only cover of any extent was along the line of trees, entending north and south about 1,000 yards to the eastward, and the problem was to discover the exact position of the enemy in that cover, and to make the attack across the open field against the fire of modern rifles, in the most approved and safest form, as disclosed by the study of the actions in the later wars.

2.00.—To this end the regiment formed under cover in swale *I*, in a line parallel to the line of trees on the river bank, and a battalion reserve of three companies was detached and placed under command of Lieutenant-Colonel Cone. The first platoon of each of the five remaining companies were deployed as skirmishers at several yards interval, and the second platoon formed the battalion support under Major Goodrich.

2.12.—The bugle sounded the advance, and the skirmish line moved cautiously up the slope and rapidly across the intervening higher ground into the next hollow, where they opened fire upon the enemy's line, firing in volleys by groups or company and concentrating the fire upon the point from which the return fire seemed hottest.

2.20.—Although the line for the purposes of instruction moved forward only by the bugle sound, the movement was by sections and groups, and such precautions as were possible were taken to avoid exposure to fire from the opposing line.

2.30.—The advance was soon continued into the next hollow, and as the movement developed the fire from a line greater in extent than the attacking line, the battalion support was thrown forward to reinforce and extend it.

2.45.—The line advanced to successive hollows, moving rapidly across the exposed rising ground between, until a position was reached about 150 yards from the defense; in each hollow the men lying down and crawling up cautiously to the crest of the next rise, from which they fired upon the enemy and then rose quickly for the forward rush.

2.53.—The battalion reserve had followed the advance in short column formation, and it was now thrown forward and joined to the single rank fighting line. Bayonets were then fixed, and after a continued fire for several minutes, the line rose and charged the enemy's line with a loud cheer, carrying the position from which the defenders were driven.

The men along the line of trees on the bank had been placed there prior to the starting of the battalion, in groups and in open order, simply to indicate the extent of front to be attacked, and the position and extent of this force was unknown to the line officers and men until developed and disclosed by the attack.

3.10.—The units of organization—companies—were each withdrawn by the respective company commanders, assembled on left skirmisher, and, after a short rest, the regiment formed in column of fours, and

3.35.—Started on the return to the Armory.

Respectfully submitted,

CHAS. L. BURDETT,

Acting Engineer and Signal Officer, First Regiment C. N. G.

Report of Colonel Charles P. Graham Concerning Spring Parade Second Regiment C. N. G.

HEADQUARTERS SECOND REGIMENT C. N. G.,
MIDDLETOWN, June 18, 1883.

Brigadier-General D. N. COUCH,
Adjutant-General State of Connecticut:—

GENERAL:

I have the honor to report that I attended the May parades of the companies of this regiment (except companies I and K), in compliance with G. O. No. 8 c. s. from your office, and respectfully submit the following report:

Orders were issued from these headquarters directing a full half day's rifle practice in each company, the balance of the day to be devoted to company and skirmish drill, and to instruction in guard duty by posting sentinels, etc. The weather being favorable on the days assigned for the parades, every company was enabled to fully comply with the orders, and I believe derived very much benefit from the day's practice and instruction.

Not being able to attend the parades of companies I and K, I directed Lieutenant-Colonel Leavenworth to be present, but owing to sickness he was unable to be with company I. Captain Wood reported to me in writing a full account of the company work for the day, which was very satisfactory.

Lieutenant-Colonel Leavenworth reported a faithful compliance with orders on the part of company K, and a very satisfactory day's duty performed. This company is making progress under its new Captain, gaining the largest number of recruits of any company in the regiment this year.

I find the efficiency and discipline of all the companies full as good as last year, and some have improved. Company G shows a decided improvement in drill. Company H shows a larger percentage present than last year, and has advanced in many respects. Company D is the lowest in membership, but maintains its efficiency in drill and discipline. Company B shows decided improvement in the manual.

The company officers of the regiment deserve great credit for their efforts to maintain their companies to the present standard. Men are

being constantly discharged, and new ones to be enlisted makes active work necessary throughout the year.

I found 474 officers and men present for duty, 76 absent; total, 550; per cent. present, 86.

I herewith enclose consolidated morning report, showing present and absent in each company, with date of parade. I also enclose report of rifle practice in each company.

Very respectfully, your obedient servant,

CHARLES P. GRAHAM,

Colonel Second Regiment C. N. G.

REPORT OF TARGET PRACTICE,

In Companies of Second Regiment C. N. G.

At May Parade, 1883.

COMPANIES.	A	B	C	D	E	F	G	H	I	K	
No. of officers and men shooting	44	36	46	35	45	39	49	40	46	27	407
No. qualified in 4th class.....	5	26	32	12	8	39	2	13	4	9	150
No. qualified in 3d class.....	10	9	13	15	8	..	1	14	11	7	88
No. qualified in first stage, 2d class...	..	..		..	..	..	19	6	22	..	47
No. qualified in 2d class.....	15	..	..	..	..	..	.	..	..	17	32

The number of men qualifying in companies B, C, D and F, in fourth class, is large. Many have qualified in this class before, but owing to not having range facilities the men were obliged to practice at 100 and 200 yards.

Company E is only credited with the qualifications of new men not previously qualifying.

CONSOLIDATED MORNING REPORT OF THE SECOND REGIMENT C. N. G., SPRING PARADE, 1883.

SPRING PARADE BY COMPANIES.	PRESENT. FOR DUTY.							ABSENT. WITH LEAVE.					ABSENT. WITHOUT LEAVE.					RECAPITULATION. PRESENT.		ABSENT.		PRESENT AND ABSENT.		
	Captains.	Lieutenants.	Sergeants.	Corporals.	Musicians.	Privates.	Total Present.	Line Officers.	Non-Com. Officers.	Musicians.	Privates.	Total.	Non-Com. Officers.	Musicians.	Privates.	Total.	Total Absent.	Commissioned Officers.	Enlisted Men.	Commissioned Officers.	Enlisted Men.	Commissioned Officers.	Enlisted Men.	Aggregate.
Co. A, Capt. F. R. White, May 23.	1	2	5	7	2	35	52	..	..	..	2	2	....	....	2	2	4	3	49	....	4	3	53	56
Co. B, Capt. F. W. Tiesing, May 15.	1	2	6	8	2	35	54	..	..	..	1	1	....	....	3	3	4	3	51	....	4	3	55	58
Co. C, Capt. J. H. Keefe, May 15.	1	1	3	4	2	35	46	1	..	..	..	1	1	....	5	6	7	2	44	1	6	3	50	53
Co. D, Capt. L. I. Thomas, May 18.	1	2	5	6	1	20	35	..	1	..	1	2	....	1	8	9	11	3	32	....	11	3	43	46
Co. E, Capt. H. R. Loomis, May 18.	1	2	4	3	2	37	49	..	2	..	5	7	....	....	2	2	9	3	46	....	9	3	55	58
Co. F, Capt. Geo. S. Arnold, May 9.	1	2	4	8	2	22	39	..	..	..	12	12	....	....	....	....	12	3	36	....	12	3	48	51
Co. G, Capt. P. F. Bannon, May 23.	1	2	3	7	1	37	51		1	1	9	11	....	....	....	....	11	3	48	....	11	3	59	62
Co. H, Capt. E. O. Shaler, May 17.	1	2	4	7	1	29	44	..	1	1	5	7	....	....	....	....	7	3	41	....	7	3	48	51
Co. I, Capt. H. B. Wood, May 18.	1	2	4	8	2	32	49	..	..	..	5	5	....	....	2	2	7	3	46	....	7	3	53	56
Co. K, Capt. B. A. Treat, May 26.	1	2	5	8	1	38	55	..	..	..	3	3	....	....	1	1	4	3	52	....	4	3	56	59
Total.....	10	19	43	66	16	320	474	1	5	2	43	51	1	1	23	25	76	29	445	1	75	30	520	550

Report of Colonel William H. Tubbs Concerning Spring Parade Third Regiment C. N. G.

HEADQUARTERS THIRD REGIMENT C. N. G.
NEW LONDON, June 1, 1883.

Brigadier-General D. N. COUCH,
Adjutant-General State of Connecticut:—

GENERAL:

In pursuance of General Orders No. 8, A. G. O., dated April 18, 1883, I attended the May parades of the several companies of this regiment, and have the honor to make the following

CONSOLIDATED REPORT.

COMPANIES.	A	B	C	D	E	G	I	K	Totals	Total on Rolls.
DATES.	15th.	16th.	17th.	18th.	23d.	24th.	18th.	23d.		
Officers and men present...	35	37	43	41	43	43	38	36	316	
Officers and men absent....	16	15	10	7	2	4	20	17	91	407
RIFLE PRACTICE.										
Qualified in fourth class....	16	15	25	3	16	26	9	14	124	
Qualified in third class.....	8	8	8	3	..	...	1	7	35	

The time occupied was four hours in rifle practice and four hours in skirmish drill and guard duties. Only four sights were returned to each company, which caused slow work, and for some reason unsatisfactory results. The sights are not properly jointed and tested, the shock of the rifle causing some of them to move from position adjusted.

Nearly all of the absentees were out of town temporarily or sick, while a few were unable to be present on account of business.

There was a marked improvement in all of the companies as com-

pared with last year's May parade, the most noticeable, perhaps, being in companies E and G. There are many new men, and both officers and men seemed interested in their duties, but I feel compelled to say that I have never seen so little attention paid by all officers and men to salutes and military etiquette. The habit of addressing each other by their given name, instead of by their proper military rank, was quite common.

Very respectfully,

WILLIAM H. TUBBS,

Colonel Commanding Third Regiment C. N. G.

Report of Colonel G. S. Crofut Concerning Spring Parade Fourth Regiment C. N. G.

HEADQUARTERS FOURTH REGIMENT C. N. G.,
BETHEL, May 21, 1883.

Brigadier-General DARIUS N. COUCH,
Adjutant-General State of Connecticut:—

GENERAL:

I have the honor to transmit herewith the report of the condition of the companies of the Fourth Regiment, C. N. G.; also result of target practice of said companies, in pursuance of General Orders No. 8, A. G. O., c. s.

I visited each company and witnessed the various movements performed by them, which, consisting of the usual tactical maneuvers, were performed by the companies almost universally well. The largest portion of the time spent during the half day devoted to drill was in skirmishing and guard duties, posting and relieving sentinels, instructing them in their duties by day, the various salutes to be given, and to whom such honor was due; and their duties at night, the challenges to be given to relief, to grand rounds, or on the approach of any person or parties. It appeared to me to be more essential to inform myself of the proficiency of each company in the performance of those duties upon which the safety of an army always depends—vigilant and well-instructed sentinels, and the readiness with which each company could deploy, rally or assemble to attack or to receive the attack of an enemy. Some of the companies are well instructed in the skirmish drill, notably so companies B and E. Company B is well instructed in the bugle calls; its skirmish drill is conducted entirely by them. Companies A, D, E, F and G, although not so well instructed in this drill, before the close performed each movement with a rapidity and accuracy which did great credit both to the officers and men.

With the exception of B and E, the companies devoted one-half of the day, under the instruction of the Inspector of Rifle Practice, to rifle practice. Companies B and E, owing to the passage of a city ordinance forbidding to shoot within the city limits, had no range at which to practice.

The following tables contain the result of target practice and number of men present for duty:

PRESENT FOR DUTY.

A	B	D	E	F	G	I	K	Whole Number Present.
30	51	60	54	46	39	50	44	374

REPORT OF TARGET PRACTICE.

COMPANIES A, D, F, G, I, K.

At May Parade by Company, 1883.

	A	D	F	G	I	K	
Number qualified in fourth class	14	9	....	....	10	6	39
Number qualified in third class	..	1	15	....	....	15	31
Number qualified in second class	....	....	....	7	4	....	11
Number qualified in first class	....	....	....	8	....	....	8

Some of the companies, owing to lack of time, were unable to complete their scores. Having only four sights to each company, delayed in some measure prompt shooting.

Respectfully submitted.

I have the honor, General, to be

Very respectfully, your obedient servant,

GEORGE S. CROFUT,

Colonel Fourth Regiment, C. N. G.

Report of Major F. M. Welch Concerning Spring Parade Fifth Battalion C. N. G.

HEADQUARTERS FIFTH BATTALION C. N. G.,
BRIDGEPORT, CONN., June 4, 1883.

Brigadier-General D. N. COUCH,
Adjutant-General State of Connecticut:—

GENERAL:

I have the honor to report that, in compliance with General Orders No. 8, A. G. O., dated April 18, 1883, the companies of this command paraded as follows: Company A, May 22d; Company B, May 24th; Company C, May 15th, all of which I attended in person.

COMPANY A.

In consequence of rain throughout the day, this company was compelled to perform the day's duty in the armory. Good use was made of the time. Guard and sentinel duty was drilled with evident advantage to the command.

Dress parade ended the day's duty. The attention to and obedience of commands was good, and the men showed themselves eager to acquire a full knowledge of their duties.

Uniforms, arms, and equipments were in good and serviceable condition.

COMPANY B.

This command had a fine day. It was early at the range, and used a full half day in rifle practice. Their work is a promise of good results during the practice season. After an hour's intermission, guard and sentinel duty was taken up, and a skirmish drill completed the day's work.

This company is in fine and effective condition, and its officers are very earnest and painstaking in the performance of their duties.

COMPANY C.

On the assembling of this command in its armory it was raining, which made it a little late in marching out. In consequence of having no range, it proceeded to the adjoining town of Stratford, and

practiced at the range of company K, Fourth Regiment. After a half day's work at the butts and guard mounting, posting and relieving sentinels, line was formed for the march home at 6 p. m. Skirmish drill was practiced during the march. The command arrived at its armory at 8 p. m.

This company is in good condition. Its arms, uniforms, and equipments are well kept, and its members work well together. The officers are not as painstaking as they might be, but improvement seems to be their aim.

PRESENT AND PERFORMING DUTY.

COMPANIES.	Captains.	Lieutenants.	Sergeants.	Corporals.	Musicians.	Privates.	Total.
A	1	2	5	7	2	34	51
B	1	2	5	6	1	39	54
C	1	2	5	7	2	32	49
Total	3	6	15	20	5	105	154

SUMMARY OF RIFLE PRACTICE.

COMPANY A.

On account of rain, no practice.

COMPANY B.

Number qualifying in fourth class 19
Number qualifying in third class 8

27

COMPANY C.

Number qualifying in fourth class 12
Number qualifying in third class 8

20

Respectfully submitted,

FRANK M. WELCH,

Major Commanding Fifth Battalion C. N. G.

[8]

REPORT OF BRIGADE INSPECTOR OF RIFLE PRACTICE.

WATERBURY, CONN., December 10, 1883.

Brigadier-General D. N. COUCH,
Adjutant-General State of Connecticut:—

GENERAL:

Pursuant to General Orders No. 7, dated A. G. O., June 1st, 1881, I have the honor to submit the annual report of rifle practice of the brigade for the season of 1883, together with a list of names of those who have qualified as sharpshooters and marksmen, this season, and their scores. This report shows a large increase in the number of sharpshooters and marksmen over last year, but it is almost entirely confined to the First Regiment, the other regiments losing more than they have gained, as is shown by the following statement:

	Loss.	Gain.
Brigade Staff	1	..
First Regiment	..	176
Second Regiment	50	..
Third Regiment	..	7
Fourth Regiment	2	..
Fifth Battalion	..	2
Total	53	185
		53
Making a gain for the Brigade of		132

The First Regiment is entitled to special mention for the interest it has exhibited in rifle practice during the past season, company K, of that regiment, reporting having qualified every man on its roll. The causes of the failure of the Brigade to show a larger list of sharpshooters and marksmen, are, I believe, the want of proper ranges for practice, and the lack of interest in rifle practice exhibited by many of the officers of the Brigade. In regard to the reports of Regimental Inspectors of Rifle Practice, my report of last year applies in all respects and with equal force to this year.

In conclusion I respectfully recommend—

First—That the time for qualification in the second class be extended to October 1st, for the purpose of giving those companies who cannot use their ranges in the months of July and August, an opportunity to qualify in that class after the haying season has passed.

Second—That (in order that rifle practice may not be neglected on account of ranges being out of repair) all ranges supported by the State be inspected during the month of April in each year, by an officer detailed for that purpose, and that all such ranges requiring repair be put in order, for use on the May field-day.

The list of sharpshooters and marksmen for 1883, and their scores, is forwarded herewith.

Very respectfully, your obedient servant,

FRED. A. SPENCER,

Major and Brigade Inspector of Rifle Practice, C. N. G.

Number of Sharpshooters and Marksmen, by Regiment.

	Sharpshooters.	Marksmen.	Total. Sharpshooters.	Total. Marksmen.
Brigade Staff	2	..	2	
First Regiment—				
Field, Staff and Non-Commissioned Staff	9	5		
Company A	2	50		
Company B	7	35		
Company D	1	14		
Company E	3	31		
Company F	18	42		
Company G	3	13		
Company H	16	28		
Company K	20	43	79	261
Second Regiment—				
Field, Staff and Non-Commissioned Staff	2	3		
Company A	1	7		
Company C	1	4		
Company D	..	5		
Company E	1	4		
Company H	1	10		
Company I	4	9		
Company K	1	11	11	53
Third Regiment—				
Field, Staff and Non-Commissioned Staff	1	1		
Company A	..	10		
Company B	..	13		
Company C	5	16		
Company E	2	1		
Company I	1	5		
Company K	4	2	13	48
Fourth Regiment—				
Field, Staff and Non-Commissioned Staff	3	..		
Company B	7	14		
Company F	4	9		
Company K	4	4	18	27
Fifth Battalion—				
Company A	1	2		
Company B	1	19	2	21
Grand total	..	..	125	410

Names and Scores of Marksmen and Sharpshooters of the Connecticut National Guard for the Year 1883.

BRIGADE STAFF.

NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
	300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Major Fred. A. Spencer, I. R. P.....	22	19	41	22	21	43	Sharpsh'er	m	m	m	s	s
Maj. Chas. L. Burdett, Eng. & Sig. Off'r	22	18	40	20	20	40	"	..	..	m	m	m

FIRST REGIMENT.

FIELD, STAFF, AND NON-COMMISSIONED STAFF.

Figure of Merit, 81.25.

Colonel L. A. Barbour.....	17	12	29	19	18	37	Marksman	m	m	m	m	m
Lieutenant-Colonel W. E. Cone.....	23	18	41	20	21	41	Sharpsh'er	..	m	m	s	..
Major A. L. Goodrich.....	18	15	33	20	21	41	"	m	m	m	m	..
Captain J. K. Williams, Adjutant.....	21	19	40	18	22	40	"	m	m	m	s	m
1st Lieut. T. C. Swan, Quartermaster..	21	12	33	18	9	27	Marksman	.	..	..	..	m
1st Lieut. W. B. McCray, Paymaster..	17	19	36	19	14	33	"	..	m	m	m	m
Major H. G. Howe, Surgeon.....	18	21	39	21	21	42	Sharpsh'er	m	m	m	s	m
1st Lieut. P. H. Ingalls, Asst. Surgeon	19	15	34	14	13	27	Marksman	..	..	..	..	..
Captain J. W. Crane, I. R. P.....	24	24	48	24	24	48	Sharpsh'er	m	m	m	s	s
1st Lieut. T. W. Gleason, Signal Off'r.	18	14	32	19	23	42	"	..	..	m	s	m
Q. M. Sergt. J. D. Worthington.....	14	16	30	19	21	40	"	..	m	m	m	s
Commissary-Sergeant W. T. Fenn.....	22	21	43	19	22	41	"	..	m	m	m	m
Hospital Steward P. W. Newton.....	16	13	29	18	16	34	Marksman	..	m	m	m	m
Drum Major W. C. Steele.....	18	16	34	19	21	40	Sharpsh'er	..	m	m	m	..

COMPANY A.

Figure of Merit, 68.33.

NAMES.		2d Class.			1st Class.			Designation.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.	1883.	1878.	1879.	1880.	1881.	1882.
Captain	W. Westphal	16	12	28	13	16	29	Marksman	..	..	m	..	m
1st Lieut.	E. Schulze	16	21	37	21	14	35	"	..	m	m	m	m
2d Lieut.	H. F. Smith	14	13	27	15	11	26	"	..	..	..	m	..
1st Sergt.	A. Brumbaum	15	13	28	16	9	25	"	..	..	m	m	..
Q.-M. Sergt.	G. Senk	19	12	31	17	8	25	"	..	..	m	..	..
Sergeant	J. P. Brennan	21	11	32	15	12	27	"	..	..	m	m	m
"	H. Bodenstein	18	13	31	19	9	28	"	..	..	..	m	..
"	F. E. Nissen	15	17	32	19	10	29	"	..	..	..	m	m
Corporal	W. H. Carter	16	14	30	16	11	27	"	..	..	..	m	..
"	F. Gans	20	13	33	21	13	34	"	..	..	..	m	..
"	C. Fisher	16	17	33	19	21	40	Sharpsh'er	m	m	m	m	..
"	A. Teweles	13	16	29	17	10	27	Marksman	..	..	m	m	m
"	A. Kaser	18	9	27	17	10	27	"	..	..	..	..	..
"	F. A. Connolly	17	10	27	18	8	26	"	..	..	m	..	..
Musician	H. E. Godbee	17	12	29	16	10	26	"	..	..	..	..	..
"	H. B. Given	14	12	26	13	16	29	"	..	..	..	..	..
Private	G. Adamson	17	9	26	17	13	30	"	..	..	..	..	..
"	W. Blevins	14	14	28	16	16	32	"	..	..	..	..	..
"	W. B. Brewer	16	18	34	14	13	27	"	..	..	..	..	..
"	C. P. Brown	13	13	26	15	13	28	"	..	..	..	..	..
"	C. F. Bodenstein	13	14	27	17	8	25	"	..	..	m	m	m
"	J. C. Bailey	17	16	33	20	8	28	"	..	..	..	m	m
"	F. N. Bacon	14	13	27	18	11	29	"	..	..	..	..	..
"	W. G. Buntin	19	16	35	19	10	29	"	..	..	..	..	m
"	F. F. Brumbaum	14	13	27	17	13	30	"	..	..	..	..	..
"	C. D. Cramer	15	13	28	18	15	33	"	..	..	..	..	..
"	J. E. Cosgrove	16	11	27	14	12	26	"	..	..	..	..	..
"	J. B. Cowles	18	8	26	14	12	26	"	..	..	..	..	..
"	J. J. Darcy	15	10	25	19	9	28	"	..	..	..	..	..
"	J. Erichsen	19	9	28	17	13	30	"	..	..	..	..	..
"	T. L. Fay	16	17	33	14	16	30	"	..	..	..	..	m
"	R. Friebel	16	16	32	18	7	25	"	..	..	..	..	..
"	H. H. Falck	15	13	28	19	8	27	"	..	..	..	..	..
"	F. Ferry	13	12	25	16	14	30	"	..	..	..	..	..
"	F. B. Goethner	13	13	26	15	10	25	"	..	..	..	..	..
"	P. Hansling	18	17	35	16	11	27	"	..	..	..	m	m
"	L. Hansen	16	11	27	16	9	25	"	..	..	..	..	..
"	J. H. Harrigan	15	11	26	18	9	27	"	..	..	..	..	..
"	W. W. Keller	21	7	28	22	18	40	Sharpsh'er	..	..	m	m	m
"	H. Kenton	15	12	27	16	17	33	Marksman	..	..	..	..	m
"	J. F. Leonard	17	9	26	16	9	25	"	..	..	..	..	..
"	A. Lawler	15	13	28	13	15	28	"	..	..	..	..	..
"	G. M. Menze	14	12	26	15	13	28	"	..	..	..	..	..
"	C. H. Noble	14	14	28	13	12	25	"	..	..	..	..	..
"	P. Rietz	17	13	30	13	13	26	"	..	..	..	..	..
"	W. J. Roberts	14	11	25	18	17	35	"	..	..	..	..	..
"	W. F. Ryan, 2d	13	13	26	15	13	28	"	..	..	..	..	..
"	C. Sommer	18	15	33	16	14	30	"	..	..	..	..	..
"	K. G. Stengel	18	13	31	15	10	25	"	..	..	..	..	..
"	W. J. Trebert	21	14	35	18	14	32	"	..	..	..	..	m
"	J. H. Winters	14	17	31	17	8	25	"	..	..	..	..	..
"	J. Wright	16	13	29	13	14	27	"	..	..	..	..	..

COMPANY B.

Figure of Merit. 63.83.

	NAMES.	2d Class.			1st Class.			Designation.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.	1883.	1878.	1879.	1880.	1881.	1882.
Captain	P. J. Moran	23	22	45	20	21	41	Sharpsh'er	m	m	m	s	m
1st Lieut.	T. F. Flanigan	16	16	32	19	10	29	Marksman	m	m	m	m	m
2d Lieut.	P. H. Smith	14	12	26	19	22	41	Sharpsh'er	..	..	m	m	m
1st Sergt.	J. J. Leahy	19	19	38	19	7	26	Marksman	..	m	m	m	m
Q.-M. Sergt.	J. P. Collins	16	10	26	15	13	28	"	..	m	..	m	..
Sergeant	J. D. Dunn	20	18	38	14	20	34	"	..	m	m	m	m
"	J. F. Lawler	18	12	30	14	11	25	"	..	..	m	m	..
Corporal	R. J. Kingsley	18	13	31	18	13	31	"	..	..	..	m	m
"	R. J. Rice	18	11	29	20	16	36	"	..	..	..	m	m
"	E. E. Coughlin	15	16	31	17	12	29	"	..	..	..	m	..
"	J. F. Moran	17	15	32	15	18	33	"	..	..	..	..	..
"	M. T. Ward	15	12	27	15	19	34	"	..	..	m	m	m
"	J. J. O'Neil	17	15	32	18	14	32	"	..	m	m	m	..
"	R. Bishop	16	19	35	16	20	36	"	..	m	m	m	m
Musician	J. J. Buggie	14	12	26	14	12	26	"	..	..	..	..	..
"	A. N. Kingsbury	15	12	27	13	17	30	"	..	..	..	..	..
Private	T. P. Ahern	21	11	32	17	13	30	"	..	..	..	..	..
"	S. J. Burke	15	13	28	17	13	30	"	..	..	..	m	..
"	W. J. Bonner	14	12	26	14	13	27	"	..	..	..	..	..
"	T. A. Brady	19	14	33	14	14	28	"	..	..	..	..	..
"	C. E. Byrnes	13	13	26	18	11	29	"	..	..	..	..	..
"	J. J. Brady	15	19	34	21	21	42	Sharpsh'er	..	..	..	..	..
"	J. P. Carmody	19	15	34	18	14	32	Marksman	..	..	..	..	..
"	T. Clark	22	17	39	20	21	41	Sharpsh'er	..	..	..	..	m
"	W. A. Canty	15	13	28	16	11	27	Marksman	..	..	..	..	..
"	P. A. Daly	14	11	25	15	12	27	"	..	..	..	..	..
"	R. Fallon	16	19	35	14	17	31	"	..	m	m	m	m
"	D. G. Foley	16	9	25	15	10	25	"	..	..	..	..	.
"	J. J. Farmer	13	16	29	14	12	26	"	..	..	..	..	..
"	J. Hurley	19	12	31	20	18	38	"	..	m	m	m	m
"	T. F. Hayes	13	14	27	13	16	29	"	..	..	..	m	..
"	M. J. Hafey	13	15	28	18	22	40	Sharpsh'er	..	..	..	..	m
"	M. J. Henson	13	12	25	16	17	33	Marksman	..	..	..	..	..
"	M. K. Lally	18	13	31	16	19	35	"	..	..	..	..	..
"	M. W. Landers	15	10	25	20	22	42	Sharpsh'er	..	..	..	..	..
"	J. F. Lehan	13	12	25	13	13	26	Marksman	..	..	..	..	..
"	P. A McCann	17	12	29	18	15	33	"	..	..	m	m	m
"	R. Magonigal	18	22	40	18	15	33	"	..	..	m	m	m
"	J. F. McDermott	14	17	31	22	19	41	Sharpsh'er	..	..	..	..	m
"	T. P. Quirk	13	12	25	14	11	25	Marksman	..	..	..	..	..
"	W. Sparks	14	17	31	13	22	35	"	..	..	m	m	m
"	T. J. Whalen	18	18	36	19	15	34	"	..	..	m	m	m

COMPANY D.

Figure of Merit, 31.43.

	NAMES.	2d Class.			1st Class.			Designation.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.	1883.	1878.	1879.	1880.	1881.	1882.
Captain	A. N. Bennett	16	14	30	20	18	38	Marksman	m	m	m	..	..
2d Lieut.	W. E Allen	19	13	32	18	16	34	"	.	m	m	..	m
Sergeant	P. P. Lynch	14	13	27	13	12	25	"	..	.	..	..	..
"	F. V. Chapin	24	24	48	23	20	43	Sharpsh'er	m	m	m	s	m
Corporal	J. Fenton	16	14	30	15	15	30	Marksman	..	..	.	..	..
"	E. A. Lawton	14	14	28	13	13	26	"	..	..	..	..	..
"	C. H. Allen	13	13	26	16	13	29	"	..	..	..	..	..
"	W. Corker	13	13	26	15	13	28	"	..	..	..	..	..
Musician	G. Scheidler	16	16	32	14	15	29	"	..	..	..	..	..
"	H. Scheny	15	16	31	15	15	30	"	..	m	..	..	..
Private	E. A. Bennett	15	16	31	16	13	29	"	..	..	..	..	..
"	J. Clark	13	25	38	16	16	32	"	..	..	..	..	..
"	L. W Goodrich	15	14	29	14	12	26	"	..	..	..	..	..
"	F. W. Humphrey	14	13	27	14	14	28	"	..	..	..	..	..
"	J. McBriarty	16	15	31	13	13	26	"	m	m	..	..	m

COMPANY E.

Figure of Merit, 57.12.

Captain	A. L. Thompson	18	22	40	20	22	42	Sharpsh'er	m	m	m	..	..
1st Lieut.	G. O. McLean	18	20	38	19	22	41	"	m	m	m	..	..
2d Lieut.	T. A. McConkey	19	19	38	21	21	42	"	..	m	m	..	..
Q.-M. Sergt.	H. F. Latham	14	18	32	16	12	28	Marksman	m	m	m	..	..
Sergeant	J. J. Smith	13	15	28	14	11	25	"	m	m	m	..	..
"	F. C. Wilson	15	14	29	17	15	32	"	..	..	m	..	..
"	D. H. Marion	16	13	29	16	11	27	"	..	..	..	..	..
Corporal	E. R. Mitchell	13	16	29	15	15	30	"	..	..	..	..	..
"	H. N. Saunders	17	14	31	14	11	25	"	..	..	..	..	..
"	C. H. Rockwell	14	16	30	13	12	25	"	..	..	m	..	..
"	P. Dorsey	14	14	28	17	17	34	"	..	m	m	..	..
"	G. G. Winger	20	14	34	13	13	26	"	..	..	..	..	..
"	H. E. Stearns	17	17	34	15	13	28	"	..	..	..	..	..
Private	C. Albrecht	15	15	30	14	14	28	"	..	.	..	..	..
"	W. G. Burg	14	13	27	18	13	31	"	..	m	m	.	..
"	H. Brown	17	14	31	13	13	26	"	..	..	m	..	..
"	W. G. Brandegee	16	13	29	15	15	30	"	..	..	..	..	..
"	J. D. Baird	15	14	29	16	12	28	"	..	..	..	..	..
"	C. V. Back	14	14	28	13	16	29	"	..	..	..	..	..
"	W. B. Coyne	15	18	33	14	13	27	"	..	..	..	..	..
"	C. A. Dahlson	13	14	27	13	12	25	"	..	..	..	..	..
"	W. S. Elton	16	12	28	15	11	26	"	..	..	..	..	.
"	M. W. Humason	15	14	29	14	16	30	"	..	..	m	..	..
"	C. H. Horner	18	13	31	17	12	29	"	..	.	.	..	..
"	W. D. Meeker	13	19	32	14	12	26	"	..	.	.	..	..
"	A. D V. Newcomb	13	17	30	16	17	33	"	..	..	..	..	..
"	G. Neilson	14	1	27	15	11	26	"	..	..	..	..	..
"	F. E Richardson	17	18	35	13	15	28	"	..	..	..	..	..
"	A. A. Rolan	14	13	27	20	15	35	"	..	..	..	..	..
"	S. Sautter, Jr	15	14	29	13	14	27	"	..	..	..	..	..
"	L. Soneson	14	14	28	14	13	27	"	..	..	..	..	..
"	J. A. Turnbull	16	15	31	18	16	34	"	..	m	m	..	..
"	B. A. Upson	14	13	27	18	9	27	"	..	..	..	..	..
"	E. H. Westover	17	16	33	15	12	27	"	..	..	.	..	..

COMPANY F.

Figure of Merit, 83.01.

	NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Captain	C. E. Thompson	19	20	39	20	20	40	Sharpsh'er	..	m	m	s	m
1st Lieut.	T. T. Welles	18	18	36	22	18	40	"	m	m	m	m	m
2d Lieut.	A. Allen	22	11	33	20	20	40	"	.	m	m	m	..
1st Sergt.	E L. Morse	15	14	29	18	13	31	Marksman	..	m	m	m	m
Q.-M. Sergt.	E. C Bluehdorn	20	15	35	23	22	45	Sharpsh'er	m	m	m	m	m
Sergeant	G. B Newton	18	21	39	20	20	40	"	m	m	m	s	m
"	F. B. Wilson	13	13	26	18	19	37	Marksman	..	m	n	m	..
"	A. W. Green	22	19	41	19	23	42	Sharpsh'er	m	m	m	s	m
"	R. H. Douthwaite	20	16	36	22	22	44	"	..	m	m	s	..
Corporal	L. B. Hubbard	18	15	33	17	11	28	Marksman	..	m	m	s	..
"	C. W. Newton	18	14	32	13	12	25	"	..	m	m	m	m
"	C. H. Wickham	14	12	26	19	22	41	Sharpsh'er	..	m	m	m	m
"	F. H. Robertson	20	20	40	20	19	39	Marksman	..	m	m	m	m
"	H. W. Thompson	14	15	29	18	14	32	"	..	m	m	m	m
"	H. R. Hovey	13	19	32	18	16	34	"	..	..	..	..	m
"	W. H. Jones	18	16	34	15	17	32	"	..	..	m	m	m
"	C. E. Poindexter	14	18	32	13	14	27	"	..	..	.	m	m
Musician	E. W. Griswold	13	13	26	13	14	27	"	..	..	..	..	..
Private	H. F. Boardman	21	14	35	19	21	40	Sharpsh'er	.	..	..	s	m
"	E. F. Bolles	19	6	25	21	20	41	"	.	..	..	..	..
"	F. H. Crosthwaite	13	17	30	19	7	26	Marksman	..	..	..	m	..
"	R. L. Charpentier	19	10	29	18	15	33	"	..	..	..	.	..
"	S. B. Childs	18	12	30	18	15	33	"	..	..	..	..	..
"	G. F. Douthwaite	16	16	32	15	11	26	"	..	..	..	..	..
"	F. G. Foster	16	11	27	15	11	26	"	..	m	m	m	..
"	W. H. A. Fenton	13	21	34	15	14	29	"	..	..	..	.	..
"	G. H. Foster	13	15	28	19	15	34	"	..	.	m	..	..
"	E. H. Fenn	15	14	29	19	21	40	Sharpsh'er	..	..	..	..	..
"	J. J Gates	18	18	36	22	22	44	"	..	..	..	m	m
"	G. H. Gleason	15	10	25	21	20	41	"	..	m	.	..	..
"	W. S. Goodrich	17	9	26	18	17	35	Marksman	..	..	m	m	m
"	C. F. Houston	14	17	31	20	20	40	Sharpsh'er	..	m	m	m	m
"	W. K. Havens	13	17	30	22	16	38	Marksman	..	..	..	..	m
"	F. E Hovey	20	16	36	14	12	26	"	..	..	..	..	m
"	L H. Hutchinson	13	12	25	15	17	32	"	..	..	..	..	..
"	D. J. Jordan	13	14	27	23	21	44	Sharpsh'er	m	m	m	s	m
"	G. B King	17	14	31	14	13	27	Marksman	..	..	..	..	..
"	C. S. Knight	14	16	30	16	14	30	"	..	..	..	..	..
"	D. Low	13	14	27	15	13	28	"	..	..	..	..	..
"	H. J. Maercklein	16	13	29	17	16	33	"	..	m	m	m	m
"	L. N. Mansuy	13	16	29	14	17	31	"	..	..	..	m	..
"	R. S McIntosh	17	16	33	20	18	38	"	..	..	..	..	..
"	G. H. Otis	13	16	29	14	13	27	"	..	..	..	..	..
"	A. T. Palmer	19	7	26	17	13	30	"	..	..	..	.	..
"	E. Powell	15	12	27	15	14	29	"	..	..	..	..	..
"	T. W. Pucci	22	13	35	16	18	34	"	..	..	..	..	..
"	W. S. Richardson	13	15	28	13	20	33	"	..	..	..	..	..
"	G. W. Ripley	17	11	28	22	23	45	Sharpsh'er	..	.	..	..	m

COMPANY F—*Continued.*

	NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yd.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Private	N. H. Stevens	15	11	26	17	19	36	Marksman	..	..	..	.	..
"	G. W. Stuart	13	14	27	14	13	27	"	..	..	..	..	..
"	F. H. Smith	13	18	31	14	14	28	"	..	..	..	..	..
"	H. H. Templeton	14	11	25	16	15	31	"	..	..	.	..	..
"	S. W. Tuttle	13	14	27	14	20	34	"	.	..	..	m	..
"	R. G. Waterous, Jr	17	17	34	19	19	38	"	..	m	.	m	..
"	F. W. Weildon	14	14	28	16	14	30	"	..	..	m	m	m
"	I. W. Williams	16	15	31	18	23	41	Sharpsh'er	..	..	..	m	..
"	C. P. Woolley	17	9	26	18	15	33	Marksman	..	..	..	..	..
"	E. H. Williams	22	20	42	24	21	45	Sharpsh'er	m	m	m	s	s
"	A. W. Wickham	16	11	27	17	16	33	Marksman	..	..	..	..	..
"	M. H. Whittlesey	14	11	25	13	15	28	"	..	.	..	..	..

COMPANY G.

Figure of Merit, 32.90.

2d Lieut.	G. P. Hurd	23	20	43	21	20	41	Sharpsh'er	..	m	m	m	s
Q.-M. Sergt.	F. B. Hale	14	16	30	21	16	37	Marksman	..	.	..	m	..
Sergeant	C. L Bissell	19	19	38	22	17	39	"	..	.	.	.	m
"	F. H. Barrett	22	20	42	19	19	38	"	..	..	..	m	m
Corporal	H. W. Frietag	13	16	29	19	14	33	"	..	.	m	m	..
"	S. M. Cheney	22	15	37	20	20	40	Sharpsh'er	.	.	.	.	..
"	W Outtrim	13	15	28	18	15	33	Marksman	..	.	.	.	..
Private	H. G. Cheney	15	17	32	23	22	45	Sharpsh'er	..	.	m	m	m
"	A. Donnelly	13	13	26	13	12	25	Marksman	..	.	.	.	..
"	W. J Farmer	17	16	33	18	8	26	"	.	.	.	.	..
"	T. Joyce	14	20	34	21	12	33	"	.	.	.	.	..
"	A. J. Loveland	16	21	37	18	11	29	"	.	.	.	.	m
"	J. Marley	14	14	28	13	12	25	"	..	.	.	.	..
"	M. J. Reardon	13	13	26	13	15	28	"	..	.	.	.	..
"	W. H. Schildge	17	17	34	20	19	39	"	..	.	.	.	..
"	W. G. Tarbox	15	10	25	13	15	28	"	..	.	.	m	m

COMPANY H.

Figure of Merit, 72.13.

Captain	G. A. Cornell	17	19	36	20	21	41	Sharpsh'er	m	m	m	m	m
1st Lieut.	W. H. McLean	23	23	46	21	20	41	"	m	m	m	s	m
2d Lieut.	L. P. Smith	17	20	37	22	20	42	"	m	m	m	m	m
1st Sergt.	C. H. Patterson	18	18	36	22	19	41	"	..	m	m	m	..
Q.-M. Sergt.	J. Cunningham	14	15	29	21	19	40	"	.	..	.	m	m
Sergeant	H E. Chapman	18	16	34	22	19	41	"	.	.	.	m	m
"	F. D. Twitchell	17	15	32	21	19	40	"	..	..	..	..	m
"	A. E. Stone	15	15	30	21	19	40	"	..	..	..	m	m
Corporal	J. W. Reid	18	15	33	20	20	40	"	..	..	m	..	..
"	J. Melvin	13	15	28	13	16	29	Marksman	..	m	..	m	..

COMPANY H—*Continued.*

	NAMES.	2d Class.			1st Class.			Designation.	Previous Qualifications.				
		300 yds	400 yds.	Total.	200 yds.	500 yds.	Total.	1883.	1878.	1879.	1880.	1881.	1882.
Corporal	T. Oakes	17	12	29	15	17	32	Marksman	..	..	..	..	..
"	C. R. Darnstaedt	19	17	36	13	15	28	"	..	..	..	m	m
"	J. Goldson	20	20	40	21	19	40	Sharpsh'er	..	m	m	m	m
"	W. J. Pinney	18	11	29	22	19	41	"	..	m	m	m	m
Musician	A. Prutting	18	12	30	17	11	28	Marksman	..	..	..	..	..
"	J. H. Bailey	17	11	28	16	10	26	"	..	..	..	..	..
Private	F. Ashley	13	14	27	14	15	29	"	..	..	..	..	m
"	W. J. Asher	14	11	25	14	14	28	"	..	..	..	..	..
"	H. Avery	16	11	27	15	11	26	"	..	..	..	..	..
"	A. C. Baker	19	20	39	18	23	41	Sharpsh'er	..	..	m	m	m
"	J. D. Bonner	17	17	34	15	16	31	Marksman	..	..	..	m	m
"	F. W. Backus	21	16	37	14	16	30	"	..	..	..	..	m
"	L. E. Buckley	14	15	29	13	13	26	"	..	..	..	..	..
"	E. C. Bigelow	13	14	27	15	11	26	"	..	..	..	..	..
"	W. H. Burton	16	14	30	15	13	28	"	..	..	..	..	..
"	W. W. Corey	19	13	32	22	18	40	Sharpsh'er	..	..	..	m	m
"	H. J. Crowley	19	7	26	15	17	32	Marksman	..	..	..	..	..
"	F. H. Dean	16	20	36	21	20	41	Sharpsh'er	..	..	m	m	m
"	F. B. Dudley	17	16	33	16	13	29	Marksman	..	..	..	..	m
"	A. J. Easterby	13	15	28	18	10	28	"	..	..	..	..	..
"	W. J. Fox	13	13	26	20	8	28	"	..	..	m	m	..
"	W. E. Flynt	14	16	30	13	14	27	"	..	..	..	m	m
"	C. C. Gabriel	15	17	32	17	15	32	"	..	..	..	..	..
"	H. Hallauer	14	13	27	17	10	27	"	..	m	m	m	..
"	M. Johnson	16	11	27	19	16	35	"	..	..	..	..	..
"	W. B. McDonald	20	17	37	20	16	36	"	..	m	m	m	m
"	N. L. Marsden	14	13	27	15	19	34	"	..	..	..	..	..
"	G. E. Prindle	20	12	32	16	16	32	"	..	..	..	..	m
"	A. H. Pierce	15	14	29	15	17	32	"	..	..	..	..	..
"	F. G. Pierce	16	9	25	16	12	28	"	..	m	m	m	..
"	A. M. Stratton	17	20	37	21	19	40	Sharpsh'er	..	..	..	..	m
"	D. W. Sparks	13	15	28	16	10	26	Marksman	..	..	..	..	..
"	W. H. Thompson	16	22	38	23	18	41	Sharpsh'er	m	..	..	..	..
"	E. S. Young	24	23	47	19	18	37	Marksman	..	..	..	m	m

COMPANY K.

Figure of Merit, 86.35.

Captain	T. M. Smith	15	11	26	19	13	32	Marksman	..	m	m	m	..
1st Lieut.	S. O. Prentice	21	22	43	21	23	44	Sharpsh'er	..	m	m	m	m
2d Lieut.	J. H. Jarman	23	24	47	20	22	42	"	..	m	m	s	m
1st Sergt.	G. D. Bates	20	19	39	18	18	36	Marksman	..	m	m	m	m
Q. M. Sergt.	E. C. Quiggle	18	19	37	19	21	40	Sharpsh'er	..	m	m	s	m
Sergeant	J. H. Towne, Jr.	20	13	33	16	18	34	Marksman	..	m	m	..	..
"	D. P. Preston	18	23	41	21	21	42	Sharpsh'er	..	m	m	s	m
"	C. E. Chase	16	15	31	14	17	31	Marksman	..	m	m	m	m
"	H. W. Cook	14	14	28	20	11	31	"	..	..	m	m	..
Corporal	F. D. Rood	16	16	32	16	14	30	"	..	m	m	m	m
"	C. H. Slocum	17	13	30	19	15	34	"	..	..	m	m	m

COMPANY K—*Continued.*

	NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Corporal	W. S. Hatch	15	12	27	19	21	40	Sharpsh'er	..	m	m	m	m
"	S. H. Cornwell	13	16	29	14	14	28	Marksman	..	..	n	m	..
"	J. D. Candee	19	18	37	20	20	40	Sharpsh'er	..	m	m	m	m
"	J. F. Burpee	13	19	32	19	22	41	"	..	m	m	m	m
"	E. H. Waterman	15	12	27	17	18	35	Marksman	..	..	..	m	m
"	W. J. Tuller	14	16	30	19	21	40	Sharpsh'er	..	..	m	m	m
Musician	E. F. Harrington	24	14	38	16	17	33	Marksman	..	..	..	..	m
"	W. F. Needham	14	15	29	19	12	31	"	..	..	..	..	..
Private	W. L. B. Barker	16	18	34	20	21	41	Sharpsh'er	..	m	..	m	m
"	C. H. Bell	15	17	32	19	12	31	Marksman	..	m	m	m	..
"	W. H. Bristol	14	15	29	14	13	27	"	..	..	..	..	..
"	J. B. Cone	17	11	28	14	13	27	"	..	..	..	..	..
"	H. B. Church	15	12	27	15	16	31	"	..	..	..	..	..
"	W. B. Case	15	17	32	20	23	43	Sharpsh'er	..	..	m	m	m
"	F. N. Chapin	13	16	29	16	17	33	Marksman	..	..	..	..	..
"	E. B. Dix	13	16	29	17	13	30	"	..	..	m	m	m
"	S. P. Davis	20	13	33	14	14	28	"	..	..	..	m	..
"	E. E. Fuller	16	10	26	13	17	30	"	..	..	..	..	..
"	J. C. Hills	15	11	26	13	16	29	"	..	..	m	m	m
"	W. H. Holway	15	14	29	17	10	27	"	..	..	..	..	..
"	F. L. Hamilton	18	7	25	14	16	30	"	..	..	..	..	..
"	W. H. D. Hoffman	14	15	29	19	14	33	"	..	..	..	..	..
"	F. E. Johnson	20	11	31	21	20	41	Sharpsh'er	..	..	..	..	..
"	W. H. Kelsey, Jr.	18	10	28	17	11	28	Marksman	..	..	..	..	m
"	T. A. Kimberly	19	17	36	19	21	40	Sharpsh'er	m	m	m	m	m
"	C. B. Latimer	15	11	26	19	21	40	"	..	..	..	..	m
"	H. H. Mason	13	15	28	17	19	36	Marksman	..	..	..	m	m
"	G. W. Morrison	14	16	30	15	14	29	"	..	..	..	..	..
"	H. Parker	15	18	33	16	14	30	"	..	..	n	..	..
"	M. D. Pratt	24	21	45	18	18	36	"	..	..	m	m	m
"	L. D. Parker	17	13	30	18	22	40	Sharpsh'er	..	..	..	..	m
"	M. Penrose	18	16	34	15	21	36	Marksman	..	..	..	..	..
"	G. L. Plummer	17	17	34	19	21	40	Sharpsh'er	..	..	..	..	..
"	E. F. Rogers	14	19	33	18	13	31	Marksman	..	m	m	m	..
"	H. S. Redfield	15	16	31	18	17	35	"	..	..	..	..	..
"	H. H. Saunders	19	17	36	17	13	30	"	.	m	m	n	m
"	C. L. Sisson	20	11	31	16	13	29	"	..	..	m	m	m
"	J. G. Smith	15	10	25	15	12	27	"	.	..	m	.	..
"	E. L. Smith	14	13	27	16	16	32	"	..	..	.	..	..
"	A. N. Story	13	12	25	18	10	28	"	..	..	..	..	..
"	G. F. Scarborough	16	22	38	22	21	43	Sharpsh'er	..	m	m	s	s
"	E. J. San Souci	24	21	45	14	16	30	Marksman	..	..	m	m	..
"	W. H. Squire	15	18	33	18	23	41	Sharpsh'er	..	..	m	..	m
"	S. G. Tracy	21	21	42	20	25	45	"	..	m	m	m	m
"	R. O. Tyler	16	19	35	18	21	39	Marksman	..	..	m	..	..
"	P. Thomson	18	14	32	17	14	31	"	..	..	..	m	..
"	E. S. Tyler, Jr	14	15	29	18	14	32	"	..	..	m	m	m
"	F. W. Turner	22	18	40	17	20	37	"	..	..	..	..	m
"	W. A. Willard	20	11	31	22	21	43	Sharpsh'er	..	m	m	m	m
"	J. A. Wiley	17	13	30	18	11	29	Marksman	..	m	..	m	m
"	A. J. Welles	13	13	26	16	17	33	"	..	..	..	..	..
"	A. P. Young	21	21	42	20	22	42	Sharpsh'er	..	m	m	m	..

FIGURE OF MERIT OF FIRST REGIMENT, 62.92.

SECOND REGIMENT.

FIELD, STAFF, AND NON-COMMISSIONED STAFF.

NAMES.		2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Colonel	C. P. Graham	18	21	39	19	7	26	Marksman	m	m	m	..	..
Major	C. P. Lindsley, Surgeon	16	16	32	17	20	37	"	..	..	..	..	..
Captain	A. Allen, I. R. P	23	19	42	21	20	41	Sharpsh'er	..	..	m	s	s
1st Lieut.	W. M. Wellman, Paymaster	17	16	33	22	20	42	"	..	..	..	..	..
1st. Lieut.	W. E. Jackson, Signal Offi'r	18	21	39	18	19	37	Marksman	..	..	..	..	..

COMPANY A.

1st Lieut.	C. E. Hall	19	16	35	21	20	41	Sharpsh'er	m	m	m	m	m
2d Lieut.	F. K. Woolworth	19	19	38	19	15	34	Marksman	m	m	m	s	m
Corporal	U. A. Warner	21	21	42	20	8	28	"	..	m	m	m	m
"	H. W. Sperry	18	15	33	19	17	36	"	..	..	..	..	m
"	F. M. Berry	13	16	29	14	13	27	"	..	..	..	..	m
Private	R. Jenner	19	17	36	18	16	34	"	..	..	..	..	m
"	O. A. Squires	20	17	37	14	17	31	"	..	..	.	..	..
"	W. D. Watkins	21	20	41	16	11	27	"	..	..	..	..	m

COMPANY C.

Sergeant	J. F. Bradley	14	14	28	20	18	38	Marksman	..	..	..	..	..
"	M. Creed	16	15	31	21	19	40	Sharpsh'er	..	..	..	..	..
"	B. Dailey	16	13	29	18	19	37	Marksman	..	..	..	..	..
Private	E. F. Reynolds	16	10	26	16	19	35	"	..	..	..	..	..
"	M. J. Welch	23	15	38	18	11	29	"	..	..	..	..	..

COMPANY D.

Q.-M. Sergt.	W. E. Beach	15	14	29	19	15	34	Marksman	..	m	m	..	..
Sergeant	C. L. Parsons	13	18	31	20	17	37	"	..	..	..	..	..
"	G. L. Francis	16	13	29	18	15	33	"	..	..	..	..	..
Corporal	J. E. Mills	15	14	29	19	17	36	"	..	..	..	..	..
"	J. H. Scranton	17	14	31	17	15	32	"	..	..	..	..	..

COMPANY E.

Sergeant	R. M. Walker	22	21	43	20	22	42	Sharpsh'er	m	m	m	s	s
"	F. W. Allen	17	15	32	15	14	29	Marksman	..	..	..	..	..
Corporal	A. P. Allen	19	20	39	14	14	28	"	..	..	..	m	m
Private	G. S. Holmes	14	13	27	14	14	28	"	..	..	..	..	..
"	J. C. Kehey	15	15	30	15	15	30	"	..	..	..	..	..

COMPANY H.

	NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Captain	E. O Shaler	13	21	34	14	19	33	Marksman	m	m	m	m	m
1st Lieut.	W. U Pearne	15	22	37	18	13	31	"	m	m	m	s	m
1st Sergt.	B. D. Putnam	16	12	28	18	9	27	"	..	m	m	..	m
Sergeant	H. Emmette	25	22	47	19	13	32	"	..	..	m	m	m
"	R. Moore	15	16	31	13	15	28	"	..	..	..	..	m
Corporal	J. J. Kincaid	18	20	38	21	19	40	Sharpsh'er	m	m	m	m	s
Private	J. Berry	16	11	27	16	14	30	Marksman	..	..	..	..	m
"	H. L. Clark	16	17	33	19	6	25	"	..	..	..	..	..
"	E. W. Hall	14	18	32	17	11	28	"	..	..	..	m	m
"	C. E Johnson	15	15	30	16	12	28	"	..	..	..	..	m
"	W. W. B Markham	13	14	27	17	11	28	"	..	..	..	..	..

COMPANY I.

Captain	H. B. Wood	13	17	30	22	21	43	Sharpsh'er	m	m	m	s	s
1st Lieut.	J. N. Lane	21	22	43	24	23	47	"	m	m	m	s	s
1st Sergt.	C. R. Sanford	17	20	37	15	14	29	Marksman	..	m	m	m	m
Q.-M. Sergt.	C. B. Bowen	15	12	27	14	14	28	"	..	..	..	..	..
Corporal	T. Broadbent	17	10	27	17	14	31	"	..	m	m	m	m
"	S. G. Cornwell	16	12	28	16	15	31	"	..	..	..	m	m
Private	J. H Bacon	13	18	31	16	13	29	"	..	..	..	..	..
"	W. N. Barber	17	16	33	16	19	35	"	..	..	..	..	..
"	O. C. Burgess	22	20	42	18	22	40	Sharpsh'er	.	m	m	m	s
"	W. Halm	15	20	35	20	21	41	"	.	..	..	m	m
"	G. A. McClean	14	15	29	19	16	35	Marksman	m	..	.	..	m
"	R. W. Isbell	13	15	28	14	11	25	"	..	..	..	..	..
"	H. P. Vibert, Jr	13	16	29	18	17	35	"	..	m	m	m	m

COMPANY K.

1st Lieut.	G. G. LaBarnes	22	23	45	22	20	42	Sharpsh'er	m	m	m	s	s
Sergeant	Z. P. Beach	17	22	39	19	18	37	Marksman	m	m	m	m	s
"	A. B. Jeralds	15	18	33	14	15	29	"	..	..	..	m	..
Corporal	J. H. Dellahanty	14	14	28	16	11	27	"	..	.	.	..	..
"	S J. Stowe	18	14	32	16	17	33	"	..	m	m	..	..
"	A. L. Barlow	17	14	31	14	13	27	"	..	..	..	.	m
Private	P. Atkinson	20	17	37	17	16	33	"	..	..	..	..	..
"	J. M. Cannon	16	14	30	21	5	26	"	..	m	m	m	..
"	E. L. Deming	15	16	31	20	7	27	"	.	..	..	..	..
"	C. Myers	19	14	33	19	15	34	"	..	..	..	..	..
"	W. H. Talcott	20	20	40	21	16	37	"	m	m	m	m	s
"	H. E. Woodward	19	20	39	21	17	38	"	..	0	..	..	..

THIRD REGIMENT.

FIELD, STAFF, AND NON-COMMISSIONED STAFF.

NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
	300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Captain S. J. Miller, I. R. P.	14	15	29	18	22	40	Sharpsh'er	..	..	..	..	s
1st Lieut. T. O. Thompson, Signal Off.	15	14	29	18	14	32	Marksman	..	..	..	..	m

COMPANY A.

Captain	J. H. Hoxie	23	20	43	20	19	39	Marksman	..	m	..	..	m
1st Lieut.	H. J. Hill	21	16	37	17	13	30	"	..	..	..	..	m
2d Lieut.	W. C. Jones	20	15	35	18	13	31	"	..	..	..	..	m
Sergeant	W. R Hull	18	19	37	18	15	33	"	..	..	..	.	m
"	J. McDonough	15	14	29	16	12	28	"	..	..	.	..	m
Corporal	D E. Wilcox	19	15	34	19	12	31	"	..	..	..	..	m
"	I. Holdridge	13	13	26	18	10	28	"	..	..	..	..	m
"	G. H. Howard	16	16	32	15	13	28	"	..	..	..	..	m
"	F. Watrous	13	17	30	14	13	27	"	..	..	..	..	..
Private	H. B. Dewey	17	15	32	17	13	30	"	..	..	..	.	..

COMPANY B.

Captain	M. Twomey	16	12	28	15	11	26	Marksman	..	m	m	..	m
1st Lieut.	D. Kelcher	16	13	29	20	12	32	"	..	..	m	..	m
2d Lieut.	C. Bransfield	18	15	33	18	14	32	"	..	m	m	..	m
Sergeant	T. J. Bennett	14	11	25	14	13	27	"	..	m	..	..	m
"	E. O'Neil	15	12	27	18	11	29	"	..	..	..	..	..
"	D. English	15	12	27	20	12	32	"	..	..	..	..	..
"	H. O'Neill	18	10	28	17	15	32	"	..	m	..	.	m
Corporal	J. Leiper	15	11	26	17	9	26	"	..	..	..	..	..
"	J. H. McGuire	15	14	29	16	12	28	"	.	..	..	..	m
Private	T. J. Crowley	18	14	32	17	17	34	"	..	..	..	..	m
"	M. McCarthy	15	11	26	13	13	26	"	..	..	..	..	..
"	M. McDonnell	13	15	28	13	15	28	"	..	..	..	..	m
"	C. McCurney	13	12	25	20	15	35	"	..	..	.	.	m

COMPANY C.

NAMES.		2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Captain	W. F. Bidwell	13	12	25	15	11	26	Marksman	..	..	..	..	..
1st Lieut.	C. S Ebberts	15	15	30	14	17	31	"	..	..	..	..	..
2d Lieut.	C. H. Gilbert	15	11	26	14	11	25	"	..	..	..	.	m
Sergeant	T. B. Linton	15	15	30	17	11	28	"	..	..	..	..	..
"	J. W. St. John	14	11	25	19	21	40	Sharpsh'er	..	..	..	..	m
"	G. L. Griswold	14	12	26	16	17	33	Marksman	..	..	..	..	m
Corporal	H. N. Small	18	9	27	13	14	27	"	..	..	..	..	..
"	E. L. Chappell	21	7	28	13	16	29	"	..	..	..	..	m
"	H. C. Bridgham	13	14	27	13	15	28	"	..	..	.	..	..
"	H. B. Hatten	17	21	38	22	21	43	Sharpsh'er	..	..	..	..	m
"	H. C. Geer	13	14	27	14	11	25	Marksman	..	..	.	..	m
Private	G. K. Brush	17	21	38	15	14	29	"	..	..	..	..	m
"	W. B. Dennison	13	13	26	14	11	25	"	..	..	..	..	..
"	W. G. Haselden	20	19	39	19	21	40	Sharpsh'er	..	..	..	..	m
"	I. E. Hill	20	10	30	13	12	25	Marksman	..	..	..	..	..
"	M. J. Lyons	14	13	27	19	11	30	"	..	..	..	..	..
"	C. E Lumis	17	8	25	16	16	32	"	..	..	..	..	..
"	J. Moran	19	6	25	19	18	37	"	..	..	..	..	..
"	M. J. Murphy	19	17	36	18	13	31	"	..	..	..	..	..
"	W. H. Platt	16	12	28	24	24	48	Sharpsh'er	..	..	..	..	..
"	J. E. Robinson	18	13	31	19	23	42	"	..	..	..	..	..

COMPANY E.

Captain	T. Foran	16	17	33	22	18	4	Sharpsh'er	..	..	..	..	..
1st Lieut.	T. Ashton	24	17	41	22	23	45	"	..	..	..	..	m
Private	H. Rollock	13	16	29	16	17	33	Marksman	..	..	.	..	m

COMPANY I.

1st Lieut.	J. E. Harris	15	13	28	16	15	31	Marksman	..	..	..	..	m
Sergeant	A. F. Bishop	22	24	46	21	19	40	Sharpsh'er	..	m	m	..	..
Corporal	G. W. Metcalf	19	19	38	16	13	29	Marksman	..	..	..	..	m
"	E. L. Crowell	19	13	32	14	14	28	"	..	..	..	..	m
Private	A. S. Darling	16	14	30	17	10	27	"	..	..	..	..	..
"	J. A. Malona	21	17	38	19	8	27	"	..	..	..	..	..

COMPANY K.

Captain	C. P. Boynton	21	18	39	23	20	43	Sharpsh'er	..	..	..	.	s
Sergeant	P. S. Rice	19	15	34	24	24	48	"	..	..	..	..	m
Corporal	A. Foulds	15	13	28	23	19	42	"	..	..	..	..	..
"	F. D. Winsor	15	13	28	16	16	32	Marksman	..	..	..	..	..
Musician	W. E. Taylor	19	18	37	18	10	28	"	..	..	..	..	m
Private	W. H. Bell	18	13	31	21	19	40	Sharpsh'er	..	..	..	..	m

FOURTH REGIMENT.

FIELD, STAFF, AND NON-COMMISSIONED STAFF.

NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
	300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		1878.	1879.	1880.	1881.	1882.
Major G. F. Lewis, Surgeon	21	20	41	20	23	43	Sharpsh'er	..	m	m	..	s
Captain S C. Kingman, I. R. P.	24	21	45	20	21	41	"	m	m	m	s	s
Sergeant-Major G. E. Derrick	21	17	38	20	20	40	"	m	m	m	s	s

COMPANY B.

Captain	G. W. Cornell	21	20	41	20	21	41	Sharpsh'er	m	m	m	s	s
1st Lieut.	F. A. King	17	18	35	21	19	40	"	m	m	m	s	m
2d Lieut.	C. A. Blakeman	18	19	37	21	20	41	"	m	m	m	s	m
1st Sergt.	C. H. Gibner	20	18	38	22	20	42	"	m	m	m	s	m
Q.-M. Sergt.	C A. Judson	17	19	36	21	21	42	"	..	..	m	m	m
Sergeant	G. P. Rand	16	15	31	17	11	28	Marksman	..	..	..	..	m
Corporal	G. H. Terew	15	22	37	19	19	38	"	..	..	..	m	m
"	F. C. Peet	18	18	36	15	18	33	"	..	..	..	m	m
"	W. H. Morrison	16	15	31	17	17	34	"	..	..	..	m	m
"	A. Hitchcock	24	20	44	20	22	42	Sharpsh'er	..	..	..	s	s
"	G. E. Fox	17	19	36	19	15	34	Marksman	..	..	..	m	m
"	E. T. Rew, Jr	14	14	28	18	19	37	"	..	..	..	m	..
"	F. V. Gilhuley	14	12	26	15	15	30	"	..	..	..	..	m
Private	C. W. Ball	13	14	27	18	10	28	"	..	..	..	..	..
"	A. Elwood	13	13	26	13	13	26	"	..	..	..	..	..
"	J. H. S. Jones	19	18	37	15	18	33	"	..	..	..	..	m
"	F. P. King	21	20	41	22	19	41	Sharpsh'er	..	..	..	m	m
"	J. L. Pancoast	18	17	35	16	12	28	Marksman	..	..	..	..	m
"	W. F. Stickles	15	11	26	15	15	30	"	..	..	..	..	..
"	H. St Cyr	15	11	26	15	16	31	"	..	..	..	..	..
"	J. E. Williams	19	15	34	18	15	33	"	..	..	..	m	s

COMPANY F.

Captain	A. A. Betts	19	18	37	15	20	35	Marksman	m	..	..	..	..
Sergeant	H. Rider	15	13	28	19	18	37	"	..	..	..	..	..
"	N. Martin	16	14	30	15	16	31	"	..	..	..	..	..
"	O. S. Youngs	15	14	29	17	17	34	"	..	..	..	..	..
Corporal	J. A. Burr	18	16	34	20	21	41	Sharpsh'er	..	..	..	..	m
Musician	H. Matheis	14	13	27	20	20	40	"	..	..	..	..	m
Private	G. F. Austin	15	14	29	15	14	29	Marksman	..	..	..	..	..
"	H. D. Cornell	20	15	35	20	22	42	Sharpsh'er	..	..	..	..	m
"	E. Fancher	13	15	28	17	17	34	Marksman	..	..	..	..	..
"	R. C. Hitchcock	16	17	33	15	12	27	"	..	..	..	..	..
"	L. Merritt	16	18	34	20	19	39	"	..	..	..	..	..
"	S H. Selleck	13	13	26	13	16	29	"	..	..	m	..	..
"	W. B. Warner	18	17	35	20	20	40	Sharpsh'er	..	..	..	..	..

COMPANY K.

	NAMES.	2d Class.			1st Class.			Designation. 1883.	Previous Qualifications.				
		300 yds.	400 yds.	Total.	200 yds.	500 yds.	Tot-l.		1878.	1879.	1880.	1881.	1882.
Captain	B. H. Weller	19	23	42	22	24	46	Sharpsh'er	m	m	m	..	s
1st Lieut.	E. Morehouse	19	19	38	19	22	41	"	m	m	m	..	s
Sergeant	E. F. Hall	19	13	32	23	19	42	"	..	m	m	..	m
"	S. Judson, Jr.	20	17	37	19	21	40	"	..	..	m	..	s
Private	M. Fryer	13	13	26	16	18	34	Marksman	..	..	..	..	..
"	A. M. Porter	20	21	41	20	18	38	"	..	m	m	..	..
"	J. H. Stagg	19	15	34	17	12	29	"	..	..	m	..	m
"	P. F. Strasburger	16	16	32	17	18	35	"	..	..	..	..	m

FIFTH BATTALION.

COMPANY A.

Corporal	A. B Harris	20	15	35	20	11	31	Marksman	..	..	..	s	s
Private	A. Brown	16	10	26	18	8	26	"	..	..	..	.	m
"	J. Treadwell	16	16	32	19	22	41	Sharpsh'er	..	..	..	..	s

COMPANY B.

Captain	L. G. Seymour	13	13	26	20	7	27	Marksman	..	..	..	..	..
1st Lieut.	L. E Seymour	14	15	29	20	12	32	"	..	..	..	..	..
2d Lieut.	J. Jones	14	14	28	17	8	25	"	..	..	..	..	..
1st Sergt.	H. H. Williams	13	13	26	17	12	29	"	..	..	..	..	..
Sergeant	A. W. Green	14	16	30	20	21	41	Sharpsh'er	..	..	..	m	m
Q.-M. Sergt.	G. F. Freeman	14	14	28	18	7	25	Marksman	..	..	..	..	..
Corporal	F. Hamilton	15	14	29	15	13	28	"	..	..	..	..	..
"	J. A. Smith	14	13	27	14	11	25	"	..	..	..	..	..
"	V. E. Davis	15	14	29	17	8	25	"	..	..	..	..	..
"	A. M. Seymour	13	14	27	13	12	25	"	..	..	..	..	..
Private	B. E. S. Babcock	13	13	26	16	14	30	"	..	..	..	..	..
"	P. Brownley	13	14	27	17	8	25	"	..	..	..	..	..
"	S. Corbin	16	14	30	15	13	28	"	..	..	..	..	..
"	J. Gordon	13	17	30	18	7	25	"	..	..	..	..	..
"	W. H. Jackson	13	16	29	16	13	29	"	..	..	..	..	..
"	J. W. Laws	13	13	26	15	14	29	"	..	..	..	..	..
"	B. Smith	14	14	28	16	11	27	"	..	..	..	..	..
"	G. M. Strong	14	13	27	17	8	25	"	..	..	..	..	..
"	A. E. Williams	14	13	27	13	12	25	"	..	..	..	..	..
"	I. Waterman	13	15	28	18	10	28	"	..	..	..	..	..

FIGURE OF MERIT OF FIRST REGIMENT, BY COMPANY.

FIELD AND STAFF.

Sharpshooters	9	×	100	=	900
Marksmen	5	×	80	=	400
First class	0				
Second class	0				
Third class	0				
Fourth class	0				
Absentees	2				
	16				1,300

Figure of merit, 81.25.

COMPANY A.

Sharpshooters	2	×	100	=	200
Marksmen	50	×	80	=	4,000
First class	4	×	60	=	240
Third class	1	×	20	=	20
Fourth class	5	×	10	=	50
Absentees	4	×	0	=	0
	66				4,510

Figure of merit, 68.33.

COMPANY B.

Sharpshooters	7	×	100	=	700
Marksmen	35	×	80	=	2,800
First class	5	×	60	=	300
Third class	1	×	20	=	20
Fourth class	1	×	10	=	10
Absentees	11	×	0	=	0
	60				3,830

Figure of merit, 63.83.

COMPANY D.

Sharpshooters	1	×	100	=	100
Marksmen	14	×	80	=	1,120
First class	3	×	60	=	180
Second class	1	×	40	=	40
Third class	14	×	20	=	280
Fourth class	4	×	10	=	40
Absentees	19	×	0	=	0
	56				1,760

Figure of merit, 31.43.

COMPANY E.

Sharpshooters	3	×	100	=	300
Marksmen	31	×	80	=	2,480
First class	11	×	60	=	660
Second class	6	×	40	=	240
Third class	4	×	20	=	80
Fourth class	1	×	10	=	10
Absentees	10	×	0	=	0
	66				3,770

Figure of merit, 57.12.

COMPANY F.

Sharpshooters	18	×	100	=	1,800
Marksmen	42	×	80	=	3,360
First class	1	×	60	=	60
Fourth class	1	×	10	=	10
Absentees	1	×	0	=	0
	63				5,230

Figure of merit, 83.01.

COMPANY G.

Sharpshooters	3	×	100	=	300
Marksmen	13	×	80	=	1,040
First class	2	×	60	=	120
Second class	9	×	40	=	360
Third class	8	×	20	=	160
Fourth class	6	×	10	=	60
Absentees	21	×	0	=	0
	62				2,040

Figure of merit, 32.90.

COMPANY H.

Sharpshooters	16	×	100	=	1,600
Marksmen	28	×	80	=	2,240
First class	8	×	60	=	480
Second class	2	×	40	=	80
Absentees	7	×	0	=	0
	61				4,400

Figure of merit, 72.13.

COMPANY K.

Sharpshooters	20	×	100	=	2,000
Marksmen	43	×	80	=	3,440
	63				5,440

Figure of merit, 86.35.

FIRST REGIMENT C. N. G.

Sharpshooters	79	×	100	=	7,900
Marksmen	261	×	80	=	20,880
First class	34	×	60	=	2,040
Second class	18	×	40	=	720
Third class	28	×	20	=	560
Fourth class	18	×	10	=	180
Absentees	75	×	0	=	0
	513				32,280

Figure of merit, 62.92.

[9]

REPORT OF EXAMINING BOARD.

NORWALK, Conn., September 25, 1883.

To Adjutant-General of Connecticut:—

MY DEAR SIR:

I have the honor to forward you, enclosed, a list of candidates for promotion in the Connecticut National Guard, who were examined and passed by the Examining Board, which convened at Niantic, September 11th, current, by virtue of Special Orders No. 82 from your department, a copy of which is attached.

All of the candidates presented themselves to the Board, and were passed upon as worthy of receiving their commissions.

With much satisfaction the Board informs you that it was deeply impressed with the manly character and intelligence which was apparently possessed by the officers whose names, with their respective ranks, are hereby forwarded to you.

I am, sir, very respectfully,

D. N. COUCH,

Brigadier-General, President of the Board.

BRIGADE STAFF.

Major EDWARD S. HAYDEN, Brigade Commissary.
Major CHARLES L. BURDETT, Engineer and Signal Officer.
Captain WILLIAM H. STRATTON, Aid-de-Camp.

BATTERY A.

First Lieutenant ARTHUR S. FOWLER.
Second Lieutenant EDWARD M. GILLETTE.

FIRST REGIMENT.

Captain JOHN W. CRANE, Inspector of Rifle Practice.
Captain ARTHUR J. WETHERELL.
Captain CHARLES E. THOMPSON.
First Lieutenant JOHN HICKEY.
First Lieutenant SAMUEL O. PRENTICE.
First Lieutenant WILLIAM H. MCLEAN.
First Lieutenant THOMAS W. GLEASON, Signal Officer.
First Lieutenant GEORGE O. MCLEAN.
Second Lieutenant JAMES H. JARMAN.
Second Lieutenant LUCIEN P. SMITH.
Second Lieutenant GILBERT P. HURD.
Second Lieutenant ALFRED L. THOMPSON.

SECOND REGIMENT.

Captain BRYANT A. TREAT.
Captain JOHN B. DOHERTY.
First Lieutenant EUGENE C. HILL, Quartermaster.
First Lieutenant WALTER M. WELLMAN, Paymaster.
First Lieutenant FRANK T. LEE.
First Lieutenant JOHN GARRITY.
First Lieutenant WILLIAM E. JACKSON, Signal Officer.
First Lieutenant CHARLES E. HALL.
Second Lieutenant THEODORE H. SUCHER.
Second Lieutenant JOHN DRAINE.
Second Lieutenant TIMOTHY F. CALLAHAN.
Second Lieutenant MICHAEL T. BRADLEY.
Second Lieutenant FRANK K. WOOLWORTH.

THIRD REGIMENT.

Captain THOMAS FORAN.
Captain HEZEKIAH B. SMITH, Adjutant.
First Lieutenant THOMAS ASHTON.
First Lieutenant GEORGE H. SPENCER.
First Lieutenant THOMAS O. THOMPSON, Signal Officer.
Second Lieutenant CLINTON A. WINSLOW.
Second Lieutenant PATRICK FITZPATRICK.
Second Lieutenant WILLIAM A. CHURCH.

FOURTH REGIMENT.

Captain BRUCE H. WELLER.
First Lieutenant ALFRED E. MOORE.
First Lieutenant FRANK R. NASH.
First Lieutenant EUGENE MOREHOUSE.
First Lieutenant POWELL A. ROBERTS.
First Lieutenant DAVID F. READ, Signal Officer.
Second Lieutenant GEORGE E. WRIGHT.
Second Lieutenant WILLIAM H. KNOWLES.
Second Lieutenant IRVING W. JUDSON.

SPECIAL ORDERS, No. 82.

STATE OF CONNECTICUT,
ADJUTANT-GENERAL'S OFFICE,
HARTFORD, September 4, 1883.

The following-named officers are hereby detailed for the Examining Board at Camp Waller, Niantic, by virtue of G. O. No. 15, C. S.:

Brigadier-General DARIUS N. COUCH, Adjutant-General.
Brigadier-General THOMAS MCMANUS, Quartermaster-General.
Brigadier-General JAMES B. COIT, Paymaster-General.
Major FREDERICK A. SPENCER, Brigade Staff.
Second Lieutenant PATRICK H. SMITH, First Regiment.

Any two of whom shall form a quorum for business, the ranking officer present presiding for the time being.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

[10]

GENERAL ORDERS.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 1.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, January 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred since November 1, 1882:

RESIGNED AND DISCHARGED.

First Regiment.

Major Arthur L. Goodrich, December 2, 1882.
Captain Arthur B. Keeney, Co. G, December 19, 1882.

Third Regiment.

Captain Frank S. Fowler, Co. E, December 2, 1882.

First Lieutenant Courtlandt V. R. Creed, Assistant Surgeon, Fifth Battalion, commission revoked, to date October 30, 1882.

First Lieutenant Cornelius Delury, and Second Lieutenant Nathan Benedict, Co. G, Fourth Regiment, appointments revoked, to date November 28, 1882.

PROMOTED AND APPOINTED.

First Regiment.

Arthur L. Goodrich, of Hartford, appointed Major, with rank from December 13, 1882, *vice* Goodrich resigned.

Third Regiment.

Corporal Thomas Foran, appointed Captain, Co. E, with rank from December 11, 1882, *vice* Fowler resigned.

Fourth Regiment.

William Porter, of Danbury, appointed First Lieutenant, Co. G, with rank from December 11, 1882, *vice* Delury, appointment revoked.

Frank R. Nash, of Danbury, appointed Second Lieutenant, Co. G, with rank from December 11, 1882, *vice* Benedict, appointment revoked.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, December 31, 1882.
Captain and N.-C. Staff....	.....	5	..	..	5
First Platoon.....	Guilford.....	34	..	..	34
Second Platoon.....	Clinton.....	37	..	..	37
Total.....	.....	76	..	..	76

FIRST REGIMENT.

Field, Staff, and Band. ...	Hartford.....	34	1	1	34
Company A.....	Hartford.....	52	..	..	52
Company B.....	Hartford.....	60	..	..	60
Company D.....	New Britain.....	56	..	2	54
Company E.....	New Britain.....	64	..	6	58
Company F.....	Hartford.....	60	..	..	60
Company G.....	South Manchester.....	57	..	3	54
Company H.....	Hartford.....	59	..	1	58
Company K.....	Hartford.....	64	1	2	63
Total.....	.....	506	2	15	493

SECOND REGIMENT.

Field, Staff, and Band.....	Middletown.....	35	..	..	35
Company A.....	Waterbury.....	64	..	2	62
Company B.....	New Haven.....	53	..	..	53
Company C.....	New Haven.....	58	..	..	58
Company D.....	New Haven.....	57	..	7	50
Company E.....	New Haven.....	62	..	4	58
Company F.....	New Haven.....	52	..	1	51
Company G.....	Waterbury.....	64	..	..	64
Company H.....	Middletown.....	56	..	6	50
Company I.....	Meriden.....	56	1	..	57
Company K.....	Wallingford.....	52	..	2	50
Total.....	.....	609	1	22	588

THIRD REGIMENT.

Field, Staff, and Band.....	New London.....	35	..	..	35
Company A.....	Mystic Bridge.....	53	..	..	53
Company B.....	Pawcatuck.....	58	..	4	54
Company C.....	Norwich.....	57	..	3	54
Company D.....	New London.....	53	..	..	53
Company E.....	Willimantic.....	51	..	1	50
Company G.....	Putnam.....	54	..	4	50
Company I.....	New London.....	54	..	..	54
Company K.....	Willimantic.....	53	..	6	47
Total.....	.....	468	..	18	450

FOURTH REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, December 31, 1882.
Field, Staff, and Band	Bethel	36	..	..	36
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	3	3	62
Company D	South Norwalk	64	..	2	62
Company E	Bridgeport	62	..	2	60
Company F	Norwalk	51	..	1	50
Company G	Danbury	63	2	2	63
Company I	Winsted	56	..	..	56
Company K	Stratford	55	..	..	55
Total		501	5	10	496

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	..	4	62
Company B	Hartford	65	.	4	61
Company C	Bridgeport	60	..	..	60
Total		197	..	8	189

By order of the Commander-in-Chief,

GEO. M. HARMON,

Adjutant-General.

[NOTE.—General Orders No. 22 is the last of series of 1882.]

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 2.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, January 11, 1883.

The following order from the Commander-in-Chief is hereby promulgated for the information of all concerned:

STATE OF CONNECTICUT.

EXECUTIVE DEPARTMENT, HARTFORD, January 4, 1883.

ORDER:

The following-named persons have been appointed on the Staff of the Governor and Commander-in-Chief, to take rank from the 3d day of January, 1883:

Darius N. Couch, of Norwalk, to be Adjutant-General, with rank of Brigadier-General.

Thomas McManus, of Hartford, to be Quartermaster-General, with rank of Brigadier-General.

James B. Coit, of Norwich, to be Paymaster-General, with rank of Brigadier-General.

Evelyn L. Bissell, of New Haven, to be Surgeon-General, with rank of Brigadier-General.

Francis A. Marden, of Stamford, to be Commissary-General, with rank of Brigadier-General.

Norris G. Osborn, of New Haven, to be Aide-de-Camp, with rank of Colonel.

William N. Woodruff, of Hartford, to be Aide-de Camp, with rank of Colonel.

Luke M. Heerey, of Sprague, to be Aide-de-Camp, with rank of Colonel.

George D. Post, of Putnam, to be Aide-de-Camp, with rank of Colonel.

They will be obeyed and respected accordingly.

The Adjutant-General is hereby charged with the promulgation of this order to all concerned.

THOMAS M. WALLER,
Governor and Commander-in-Chief.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 3.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, January 20, 1883.

The following appointments are hereby announced for the information of all concerned:

Joseph J. Sweeney, of New Haven, to be Assistant Adjutant-General, with rank of Colonel, from January 20, 1883, *vice* Fox resigned.

Jabez L. Woodbridge, of Manchester, to be Assistant Quartermaster-General, with rank of Lieutenant-Colonel, from January 3, 1883.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 4.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, January 24, 1883.

The resignation of Colonel Simeon J. Fox, Assistant Adjutant-General, is hereby accepted, to date January 20, 1883.

The Commander-in-Chief in accepting the resignation of Colonel Fox, takes this opportunity of acknowledging, in behalf of the State, his meritorious services during an unbroken period of nearly 14 years.

By order of the Commander in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 5.

ADJUTANT-GENERAL'S OFFCE, HARTFORD, February 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of January, 1883:

RESIGNED AND DISCHARGED.

Brigade Staff.

Major Samuel C. Waldron, Brigade Commissary, January 19, 1883.

Battery A.

First Lieutenant William T. Foote, First Platoon, January 13, 1883.

Second Regiment.

Second Lieutenant Charles W. Bogue, Co. E, January 29, 1883.

Third Regiment.

First Lieutenant James Haggerty, Co. E, January 13, 1883.
Second Lieutenant Alexander L. Fuller, Co. E, January 20, 1883.

DIED.

First Regiment.

Captain Levi H. Hotchkiss, Co. F, January 5, 1883.

PROMOTED AND APPOINTED.

Brigade Staff.

First Lieutenant Edward S. Hayden, Paymaster Second Regiment, appointed Brigade Commissary, with rank of Major from January 23, 1883, *vice* Waldron, resigned.

First Regiment.

First Lieutenant Arthur J. Wetherell, appointed Captain Co. G, with rank from January 8, 1883, *vice* Keeney, resigned.

II. Changes in the membership of the CONNECTICUT NATIONAL GUARD have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, January 31, 1883.
Captain and N.-C. Staff....	.....	5	..	..	5
First Platoon.....	Guilford.....	34	..	2	32
Second Platoon.....	Clinton.....	37	..	..	37
Total.....	.....	76	..	2	74

FIRST REGIMENT.

Field, Staff and Band.....	Hartford.....	34	1	2	33
Company A.....	Hartford.....	52	..	2	50
Company B.....	Hartford.....	60	..	..	60
Company D.....	New Britain.....	56	..	2	54
Company E.....	New Britain.....	64	..	6	58
Company F.....	Hartford.....	60	..	4	56
Company G.....	South Manchester.....	57	..	3	54
Company H.....	Hartford.....	59	..	2	57
Company K.....	Hartford.....	64	2	2	64
Total.....	.....	506	3	23	486

SECOND REGIMENT.

Field, Staff and Band.....	Middletown.....	35	..	2	33
Company A.....	Waterbury.....	64	..	3	61
Company	New Haven.....	53	..	..	53
Company C.....	New Haven.....	58	..	..	58
Company D.....	New Haven.....	57	..	7	50
Company E.....	New Haven.....	62	..	5	57
Company F.....	New Haven.....	52	..	1	51
Company G.....	Waterbury.....	64	..	..	64
Company H.....	Middletown.....	56	..	6	50
Company I.....	Meriden.....	56	1	1	56
Company K.....	Wallingford.....	52	..	5	47
Total.....	.....	609	1	30	580

THIRD REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, January 31, 1883.
Field, Staff and Band	New London	35	..	..	35
Company A	Mystic Bridge	53	..	..	53
Company B	Pawcatuck	58	..	4	54
Company C	Norwich	57	..	3	54
Company D	New London	53	..	..	53
Company E	Willimantic	51	..	4	47
Company G	Putnam	54	1	6	49
Company I	New London	54	..	..	54
Company K	Willimantic	53	..	6	47
Total		468	1	23	446

FOURTH REGIMENT.

Field, Staff and Band	Bethel	36	..	..	36
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	4	4	62
Company D	South Norwalk	64	..	3	61
Company E	Bridgeport	62	2	4	60
Company F	Norwalk	51	..	1	50
Company G	Danbury	63	2	2	63
Company I	Winsted	56	..	..	56
Company K	Stratford	55	..	..	55
Total		501	8	14	495

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	..	4	62
Company B	Hartford	65	..	4	61
Company C	Bridgeport	60	2	..	62
Total		197	2	8	191

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 6.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, March 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of February, 1883:

RESIGNED AND DISCHARGED.

Second Regiment.

Captain George H. Yale, Co. K, February 20, 1883.

PROMOTED AND APPOINTED.

Battery A.

Second Lieutenant Arthur S. Fowler, appointed First Lieutenant First Platoon, with rank from January 22, 1883, *vice* Foote, resigned.

Veterinary Sergeant Edward M. Gillette, appointed Second Lieutenant First Platoon, with rank from January 22, 1883, *vice* Fowler, promoted.

First Regiment.

First Lieutenant Charles E. Thompson, Co. K, appointed Captain Co. F, with rank from January 31, 1883, *vice* Hotchkiss, deceased.

Sergeant John Hickey, appointed First Lieutenant Co. G, with rank from February 5, 1883, *vice* Wetherell, promoted.

Second Regiment.

C. Purdy Lindsley, of New Haven, appointed Surgeon, with rank of Major from February 21, 1883, *vice* Bissell, appointed Surgeon-General.

Sergeant Major William H. Stratton, appointed Paymaster, with rank of First Lieutenant from February 21, 1883, *vice* Hayden, promoted.

Third Regiment.

Corporal Thomas Ashton, appointed First Lieutenant Co. E, with rank from January 23, 1883, *vice* Haggerty, resigned.

Corporal Timothy Connor, appointed Second Lieutenant Co. E, with rank from January 30, 1883, *vice* Fuller, resigned.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, February 28, 1883.
Captain and N.-C. Staff		5	..	1	4
First Platoon	Guilford	34	1	2	33
Second Platoon	Clinton	37	..	..	37
Total		76	1	3	74

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	1	2	33
Company A	Hartford	52	2	2	52
Company B	Hartford	60	..	3	57
Company D	New Britain	56	..	2	54
Company E	New Britain	64	..	7	57
Company F	Hartford	60	3	6	57
Company G	South Manchester	57	..	7	50
Company H	Hartford	59	..	4	55
Company K	Hartford	64	5	4	65
Total		506	11	37	480

SECOND REGIMENT.

Field, Staff and Band	Middletown	35	1	3	33
Company A	Waterbury	64	1	3	62
Company B	New Haven	53	..	1	52
Company C	New Haven	58	..	5	53
Company D	New Haven	57	..	9	48
Company E	New Haven	62	..	5	57
Company F	New Haven	52	..	5	47
Company G	Waterbury	64	..	1	63
Company H	Middletown	56	..	10	46
Company I	Meriden	56	1	1	56
Company K	Wallingford	52	..	9	43
Total		609	3	52	560

THIRD REGIMENT.

Field, Staff and Band	New London	35	..	..	35
Company A	Mystic Bridge	53	..	..	53
Company B	Pawcatuck	58	..	4	54
Company C	Norwich	57	..	3	54
Company D	New London	53	..	..	53
Company E	Willimantic	51	.	4	47
Company G	Putnam	54	1	12	43
Company I	New London	54	..	..	54
Company K	Willimantic	53	..	6	47
Total		468	1	29	440

FOURTH REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, February 28, 1883.
Field, Staff and Band	Bethel	36	..	..	36
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	4	8	58
Company D	South Norwalk	64	..	5	59
Company E	Bridgeport	62	3	9	56
Company F	Norwalk	51	..	1	50
Company G	Danbury	63	2	2	63
Company I	Winsted	56	..	2	54
Company K	Stratford	55	..	1	54
Total		501	9	28	482

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	..	4	62
Company B	Hartford	65	..	4	61
Company C	Bridgeport	60	2	..	62
Total		197	2	8	191

III. The following members of the National Guard are announced as having qualified as Sharpshooters and Marksmen during the season of 1882, in accordance with General Orders No. 7, series of 1881, in addition to those published in the Adjutant-General's report for the year 1882; and are awarded the State decoration, which is to be worn whenever the dress uniform is worn:

FIRST REGIMENT.

COMPANY H.

NAMES.	2d Class.			1st Class.			Designation.	Previous Qualifications.
	300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		
Private Frederick W. Backus	21	15	36	14	12	26	Marksman	
Private James Goldson	17	14	31	16	10	26	Marksman	'79, '80, '81.
Private George E. Prindle	14	18	32	16	11	27	Marksman	

COMPANY K.

NAMES.	2d Class.			1st Class.			Designation.	Previous Qualifications.
	300 yds.	400 yds.	Total.	200 yds.	500 yds.	Total.		
Corporal John D. Candee.....	17	18	35	20	7	27	Marksman	'79, '80, '81.

THIRD REGIMENT.

COMPANY B.

Corporal John H. McGuire.....	14	12	26	17	15	32	Marksman	....
Private Charles McCurney.....	15	12	27	19	7	26	Marksman	....

COMPANY C.

Private Edward L. Chappell.....	18	9	27	16	10	26	Marksman	....

FIFTH BATTALION.

COMPANY B.

Sergeant Albert W. Green.....	15	17	32	18	8	26	Marksman	'81.
Corporal Sidney S. Bassey.....	14	13	27	18	8	26	Marksman	....

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 7.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, April 2, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of March, 1883:

RESIGNED AND DISCHARGED.

Second Regiment.

First Lieutenant George L. Beardsley, Assistant Surgeon, March 12, 1883.
First Lieutenant Arthur M. Howarth, Co. F, March 2, 1883.

Third Regiment.

Second Lieutenant Charles A. Jackson, Co. G, March 12, 1883.
First Lieutenant A. Benj. Harrington, Co. K, March 12, 1883.

PROMOTED AND APPOINTED.

First Regiment.

First Lieutenant John W. Crane, Co. H, appointed Inspector of Target Practice with rank of Captain from March 10, 1883, *vice* Woodbridge, appointed Assistant Quartermaster-General.

Second Lieutenant Samuel O. Prentice, appointed First Lieutenant Co. K, with rank from February 19, 1883, *vice* Thompson, promoted.

Sergeant James H. Jarman, appointed Second Lieutenant Co. K, with rank from February 19, 1883, *vice* Prentice, promoted.

Second Regiment.

Bryant A. Treat, of Wallingford, appointed Captain Co. K, with rank from March 1, 1883, *vice* Yale, resigned.

Corporal Theodore H. Sucher, appointed Second Lieutenant Co. E, with rank from March 5, 1883, *vice* Bogue, resigned.

Second Lieutenant Frank T. Lee, appointed First Lieutenant Co. F, with rank from March 12, 1883, *vice* Howarth, resigned.

John Draine, of New Haven, appointed Second Lieutenant Co. F, with rank from March 12, 1883, *vice* Lee, promoted.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, March 31, 1883.
Captain and N.-C. Staff		5	..	1	4
First Platoon	Guilford	34	1	2	33
Second Platoon	Clinton	37	..	..	37
Total		76	1	3	74

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	2	2	34
Company A	Hartford	52	2	3	51
Company B	Hartford	60	2	4	58
Company D	New Britain	56	..	3	53
Company E	New Britain	64	1	16	49
Company F	Hartford	60	3	8	55
Company G	South Manchester	57	..	8	49
Company H	Hartford	59	..	6	53
Company K	Hartford	64	5	4	65
Total		506	15	54	467

SECOND REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, March 31, 1883.
Field, Staff and Band	Middletown	35	2	4	33
Company A	Waterbury	64	1	4	61
Company B	New Haven	53	4	2	55
Company C	New Haven	58	..	5	53
Company D	New Haven	57	..	9	48
Company E	New Haven	62	..	6	56
Company F	New Haven	52	4	6	50
Company G	Waterbury	64	..	2	62
Company H	Middletown	56	8	14	50
Company I	Meriden	56	1	2	55
Company K	Wallingford	52	1	11	42
Total		609	21	65	565

THIRD REGIMENT.

Field, Staff and Band	New London	35	..	..	35
Company A	Mystic Bridge	53	..	8	45
Company B	Pawcatuck	58	..	4	54
Company C	Norwich	57	..	5	52
Company D	New London	53	..	..	53
Company E	Willimantic	51	11	4	58
Company G	Putnam	54	1	13	42
Company I	New London	54	..	1	53
Company K	Willimantic	53	..	7	46
Total		468	12	42	438

FOURTH REGIMENT.

Field, Staff and Band	Bethel	36	..	..	36
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	7	9	60
Company D	South Norwalk	64	..	6	58
Company E	Bridgeport	62	5	10	57
Company F	Norwalk	51	..	1	50
Company G	Danbury	63	2	3	62
Company I	Winsted	56	..	2	54
Company K	Stratford	55	..	1	54
Total		501	14	32	483

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	..	4	62
Company B	Hartford	65	1	4	62
Company C	Bridgeport	60	6	..	66
Total		197	7	8	196

By order of the Commander-in-Chief,

D. N. COUCH

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 8. } ADJUTANT-GENERAL'S OFFICE, HARTFORD, April 18, 1883.

I. The infantry organizations of the Connecticut N tional Guard will parade during the month of May under the orders of their respective commanders, and will be required to devote one-half of the day of parade to target practice, under orders of the Colonel and supervision of the Inspector of Target Practice, and one-half of the day to such drill as the Regimental Commandant shall direct. Companies that qualified fifty per cent. of their membership as marksmen and sharpshooters in 1882 will be allowed extra ammunition for practice in file and volley firing, if such practice is authorized by the Regimental Commandant.

Company commanders will have their commands thoroughly instructed in guard duties, always remembering that a good sentinel closely observes and watches not merely his beat but all of the approaches thereto.

II. Commanding officers will attend in person, or be represented by a field officer, and will report in writing through Brigade Headquarters, as to the condition and efficiency of each company, the results of any target practice, the drills and maneuvers performed, the time occupied in target practice, the time devoted to drill, and the number in each company actually present and performing duty.

By order of the Commander-in Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 9. } ADJUTANT-GENERAL'S OFFICE, HARTFORD, May 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of April, 1883:

RESIGNED AND DISCHARGED.

Fourth Regiment.

First Lieutenant William B. Phillips, Co. I, April 16, 1883.

PROMOTED AND APPOINTED.

Third Regiment.

Clinton A. Winslow, of Putnam, appointed Second Lieutenant Co. G, with rank from April 5, 1883, *vice* Jacks n, resigned.

Second Lieutenant George H. Spencer, appointed First Lieutenant Co. K, with rank from March 24, 1883, *vice* Harrington, resigned.

Corporal Henry A. Larkin, appointed Second Lieutenant Co. K, with rank from March 24, 1883, *vice* Spencer, promoted.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, April 30, 1883.
Captain and N.-C. Staff....	.....	5	..	1	4
First Platoon.....	Guilford.....	34	1	3	32
Second Platoon	Clinton	37	..	..	37
Total	.....	76	1	4	73

FIRST REGIMENT.

Field, Staff, and Band.....	Hartford.....	34	2	4	32
Company A.....	Hartford.....	52	2	3	51
Company B.....	Hartford.....	60	4	4	60
Company D.....	New Britain.....	56	..	3	53
Company E.....	New Britain.....	64	1	16	49
Company F.....	Hartford.....	60	7	12	55
Company G.....	South Manchester.....	57	..	11	46
Company H.....	Hartford.....	59	..	6	53
Company K.....	Hartford.....	64	5	4	65
Total	.....	506	21	63	464

SECOND REGIMENT.

Field, Staff, and Band.....	Middletown.....	35	2	4	33
Company A.....	Waterbury.....	64	1	12	53
Company B.....	New Haven.....	53	4	2	55
Company C.....	New Haven.....	58	5	10	53
Company D.....	New Haven.....	57	2	12	47
Company E.....	New Haven.....	62	..	11	51
Company F.....	New Haven.....	52	4	6	50
Company G.....	Waterbury.....	64	..	3	61
Company H.....	Middletown.....	56	8	14	50
Company I.....	Meriden.....	56	1	2	55
Company K.....	Wallingford.....	52	1	12	41
Total	.....	609	28	88	549

THIRD REGIMENT.

Field, Staff, and Band.....	New London.....	35	..	.	35
Company A.....	Mystic Bridge.....	53	..	8	45
Company B.....	Pawcatuck.....	58	..	7	51
Company C.....	Norwich.....	57	..	6	51
Company D.....	New London.....	53	..	6	47
Company E.....	Willimantic.....	51	10	16	45
Company G.....	Putnam.....	54	2	14	42
Company I.....	New London.....	54	..	1	53
Company K.....	Willimantic.....	53	4	7	50
Total	.....	468	16	65	419

FOURTH REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, April 30, 1883.
Field, Staff, and Band	Bethel	36	..	..	36
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	7	10	59
Company D	South Norwalk	64	6	7	63
Company E	Bridgeport	62	5	15	52
Company F	Norwalk	51	..	1	50
Company G	Danbury	63	2	19	46
Company I	Winsted	56	..	3	53
Company K	Stratford	55	..	6	49
Total		501	20	61	460

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	..	4	62
Company B	Hartford	65	2	4	63
Company C	Bridgeport	60	6	..	66
Total		197	8	8	197

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 10.

ADJUTANT-GENERAL'S OFFICE.
HARTFORD, May 16, 1883.

I. The following Act of the General Assembly, passed January session, A. D. 1883, is published for the information of all concerned.

CHAPTER CIX.

An Act amending an Act relating to Militia.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Section three of chapter two, title ten of the general statutes (page 114) is hereby amended by striking out all after the word "guard," in the second

line, to and including the word "artillery," in the fourth line, and inserting in lieu thereof the words "and shall consist of not exceeding forty companies of infantry, and one battery of artillery. The forty companies of infantry shall be divided into four regiments, one for each congressional district, designated by the number of the district, and one battalion at large"; also by inserting after the word "town," in the twelfth line, the words "except that company musicians and members of regimental bands may be enlisted between the ages of sixteen and fifty years."

SEC. 2. Section four of said chapter two is amended to read as follows: The National Guard shall constitute one brigade under the command of a brigadier-general appointed by the commander-in-chief with the consent of the senate. The brigadier-general shall nominate on his staff an assistant adjutant-general with the rank of lieutenant-colonel, a brigade-inspector, a brigade-quartermaster, a brigade-commissary, and a brigade inspector of rifle practice, each with the rank of major; a medical director with rank of lieutenant-colonel, an engineer and signal officer with rank of major, and two aides-de-camp, each with the rank of captain. The medical director must be a graduate of a lawfully established medical college, and have been in practice for at least five years prior to date of appointment. The engineer and signal officer must be a civil engineer of at least three years' standing prior to date of appointment. The brigadier-general may appoint and warrant two orderlies, each with the rank of sergeant, who shall appear mounted on all days of review and parade when so ordered by him.

SEC. 3. Section five of said chapter two is amended to read as follows: Each regiment shall consist of not more than ten companies and a regimental band, and the field officers shall consist of a colonel, lieutenant-colonel, and major, all nominated by its field and line officers. Each colonel shall nominate on his staff an adjutant with rank of captain, a quartermaster and a paymaster, each with the rank of first lieutenant, a surgeon with rank of major, an assistant surgeon with rank of first lieutenant, an inspector of rifle practice with rank of captain, a signal officer with rank of first lieutenant, and a chaplain who shall be commissioned without rank, but entitled to pay and allowances of an adjutant. The non-commissioned staff of a regiment shall consist of a sergeant-major, a quartermaster-sergeant, a commissary-sergeant, a hospital steward, and a drum major, to be appointed by the colonel and warranted by him. The battalion at large shall consist of not more than four companies, and shall be commanded by a major. The major of the battalion shall nominate on his staff an adjutant, with rank of captain, a quartermaster, and an assistant-surgeon, each with the rank of first lieutenant. The non-commissioned staff of the battalion at large shall consist of a sergeant-major, a quartermaster-sergeant, and a drum major, all appointed by the major, and warranted by him. All surgeons and assistant surgeons must be graduates of a lawfully established medical college, and all hospital stewards must be duly licensed by the state commissioners of pharmacy.

SEC. 4. Section six of chapter two is amended by striking out in the second line the words "five sergeants," and inserting in lieu thereof the words "a first sergeant, a quartermaster-sergeant, four sergeants."

SEC. 5. Section seven of said chapter two is amended to read as follows: The battery of artillery shall consist of a captain, two first lieutenants, two second lieutenants, one first sergeant, one quartermaster-sergeant, one veterinary sergeant, four sergeants, eight corporals, two trumpeters, one guidon, not more than sixty-four nor

less than thirty-two privates. The two platoons constituting the battery of artillery may, at the discretion of the commander-in-chief, be located in different towns, and in such case the first lieutenants of platoons shall receipt for and be responsible to the state for all property issued to said platoons. To each platoon there shall be one first and one second lieutenant, nominated in the manner provided for officers of companies of infantry, two sergeants, four corporals, one trumpeter, and not more than thirty-two privates. The captain of the battery shall be nominated by the lieutenants of platoons, and he shall appoint and issue warrants for all non-commissioned officers of the battery; but if the two platoons are located in different towns, the first lieutenants of platoons shall nominate the sergeants and corporals of their respective platoons.

SEC. 6. Section nine of said chapter two is amended by inserting after the word "nomination," in fifth line, the words "and after twice disapproving he shall fill such vacancy without further nomination."

SEC. 7. Section fifteen of said chapter two is amended by inserting after the word "tactics," in line three, the words "and duties," and in lines four and five by striking out all after the word "brigadier general" to and including the word "tactics," and inserting in lieu thereof the following: "whose positions require a knowledge of military tactics or duties."

SEC. 8. Section sixteen of said chapter two is amended by adding after the word "fines," in the third line, the words "and dues," and by adding to the end of the section the words "except that it shall be legal to notify any delinquent of the incurrence of any fine or due within three months of the date when said fine or due was incurred, and notice may be given of said fines or dues collectively."

SEC. 9. Section one of chapter five of said title ten (page 120) is amended by substituting the word "October" for the word "September" in the fourth line of said section.

SEC. 10. Section eight of said chapter five is amended by striking out the compound word "semi-monthly," in the first line, and inserting in lieu thereof the word "weekly."

SEC. 11. Section three of chapter seven of said title ten (page 123), is amended by adding the following: "Any officer on trial before a court-martial may appear before said court in person, or by counsel."

SEC. 12. Section four of said chapter seven is amended by striking out in the fifth line the words "or defend."

SEC. 13. Chapter one hundred and thirty-eight of the public acts of 1878 (page 348) is amended by striking out the words "military board of examiners," and inserting in lieu thereof the words "court of inquiry."

SEC. 14. In each regiment, battalion, and battery, the commanding officer thereof shall establish a field officers' court martial, for the hearing and trial of any enlisted man against whom charges are made. This court shall consist of a field officer duly appointed in orders, and he shall keep a record of his doings and report his findings, as in cases of court-martial.

SEC. 15. Chapter thirty-one of the public acts of 1879 (page 377), and all acts and parts of acts inconsistent herewith, are hereby repealed; but this act shall not be understood as affecting the organization heretofore and now existing under the provisions of said chapter thirty-one, but the companies comprising the same shall belong to the battalion at large, as herein provided.

SEC. 16. This act shall take effect from its passage.

Approved, May 1, 1883.

II. In accordance with above law the Brigade Adjutant, C. N. G., will hereafter be designated and known as Assistant Adjutant-General of Brigade, and will be recommissioned accordingly, to date May 1, 1883. The Brigade Inspector of Target Practice and the Regimental Inspectors of Target Practice will be known and addressed as Inspectors of *Rifle* Practice.

Brigadier-General Stephen R. Smith, commanding Brigade C. N. G., will nominate for appointment on his staff, a medical director with rank of lieutenant-colonel, and an engineer and signal officer with rank of major.

The commandants of the four regiments of infantry will each nominate for appointment on his staff, a signal officer with rank of first lieutenant.

Company commanders will each nominate a quartermaster-sergeant to the commandant of his regiment, who will appoint and issue warrants for the same.

Fife majors on the regimental non-commissioned staff are rendered supernumerary, and are honorably discharged from the military service of the State. They may, however, be enlisted as musicians of regimental bands, to date from date of last appointment as fife major.

III. The companies of the Fifth Battalion and the platoons of Battery A, for the purpose of instruction in signal duties, are placed under the charge of the signal officer of the regiment in the district in which they are located.

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 11.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, June 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of May, 1883:

RESIGNED AND DISCHARGED.

First Regiment.

Second Lieutenant William R. Dunn, Co. G, May 25, 1883.

Second Regiment.

First Lieutenant Edward Lynn, Co. C, May 31, 1883.

PROMOTED AND APPOINTED.

First Regiment.

Second Lieutenant William H. McLean, appointed First Lieutenant Co. H, with rank from April 17, 1883, *vice* Crane, promoted.

Sergeant Lucien P. Smith, appointed Second Lieutenant Co. H, with rank from April 17, 1883, *vice* McLean, promoted.

Second Regiment.

Charles H. French, of Waterbury, appointed Assistant Surgeon, with rank of First Lieutenant from May 14, 1883, *vice* Beardsley, resigned.

Fourth Regiment.

Second Lieutenant Alfred E. Moore, appointed First Lieutenant Co. I, with rank from April 21, 1883, *vice* Phillips, resigned.

Sergeant George E. Wright, appointed Second Lieutenant Co. I, with rank from April 21, 1883, *vice* Moore, promoted.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, May 31, 1883.
Captain and N.-C. Staff		5	..	1	4
First Platoon	Guilford	34	1	3	32
Second Platoon	Clinton	37	..	..	37
Total		76	1	4	73

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	3	5	32
Company A	Hartford	52	6	6	52
Company B	Hartford	60	8	8	60
Company D	New Britain	56	9	11	54
Company E	New Britain	64	15	18	61
Company F	Hartford	60	12	16	56
Company G	South Manchester	57	14	14	57
Company H	Hartford	59	1	10	50
Company K	Hartford	64	10	8	66
Total		506	78	96	488

SECOND REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, May 31, 1883.
Field, Staff and Band	Middletown	35	4	5	34
Company A	Waterbury	64	8	16	56
Company B	New Haven	53	8	2	59
Company C	New Haven	58	11	17	52
Company D	New Haven	57	3	14	46
Company E	New Haven	62	10	15	57
Company F	New Haven	52	8	7	53
Company G	Waterbury	64	2	4	62
Company H	Middletown	56	10	16	50
Company I	Meriden	56	3	3	56
Company K	Wallingford	52	20	15	57
Total		609	87	114	582

THIRD REGIMENT.

Field, Staff and Band	New London	35	..	1	34
Company A	Mystic Bridge	53	7	9	51
Company B	Pawcatuck	58	3	12	49
Company C	Norwich	57	5	10	52
Company D	New London	53	1	7	47
Company E	Willimantic	51	15	24	42
Company G	Putnam	54	2	20	36
Company I	New London	54	..	1	53
Company K	Willimantic	53	4	8	49
Total		468	37	92	413

FOURTH REGIMENT.

Field, Staff and Band	Bethel	36	..	1	35
Company A	Bethel	52	..	..	52
Company B	Bridgeport	62	8	10	60
Company D	South Norwalk	64	8	11	61
Company E	Bridgeport	62	12	17	57
Company F	Norwalk	51	3	1	53
Company G	Danbury	63	5	21	47
Company I	Winsted	56	11	17	50
Company K	Stratford	55	3	7	51
Total		501	50	85	466

FIFTH BATTALION.

Field and Staff	Bridgeport	6	..	..	6
Company A	New Haven	66	3	5	64
Company B	Hartford	65	3	8	60
Company C	Bridgeport	60	9	12	57
Total		197	15	25	187

III. In accordance with law and existing orders, companies of infantry may be recruited to sixty-seven (67) officers and men.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 12.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, July 2, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of June, 1883:

RESIGNED AND DISCHARGED.

Fourth Regiment.

First Lieutenant William Porter, Co. G, June 15, 1883.

PROMOTED AND APPOINTED.

Brigade Staff.

Major Charles M. Carleton, Surgeon Third Regiment, appointed Medical Director, with rank of Lieutenant-Colonel, from June 14, 1883—original appointment.

Corporal Charles L. Burdett, Co. K, First Regiment, appointed Engineer and Signal Officer, with rank of Major, from June 14, 1883—original appointment.

First Regiment.

Private Thomas W. Gleason, Co. K, appointed Signal Officer, with rank of First Lieutenant, from June 15, 1883—original appointment.

First Sergeant Gilbert P. Hurd, appointed Second Lieutenant Co. G, with rank from June 4, 1883, *vice* Dunn, resigned.

Fourth Regiment.

Sherman H. Hubbard, of Bridgeport, appointed Signal Officer, with rank of First Lieutenant, from June 7, 1883—original appointment.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, June 30, 1883.
Captain and N.-C. Staff....	.....	5	..	1	4
First Platoon.....	Guilford.....	34	1	3	32
Second Platoon.....	Clinton.....	37	..	..	37
Total.....	.....	76	1	4	73

FIRST REGIMENT.

Field, Staff and Band.....	Hartford	34	4	5	33
Company A.....	Hartford	52	12	7	57
Company B.....	Hartford.....	60	9	8	61
Company D.....	New Britain.....	56	9	13	52
Company E.....	New Britain.....	64	15	33	46
Company F.....	Hartford	60	14	16	58
Company G.....	South Manchester.....	57	14	14	57
Company H.....	Hartford	59	4	10	53
Company K.....	Hartford	64	11	10	65
Total.....	.....	506	92	116	482

SECOND REGIMENT.

Field, Staff and Band.....	Middletown.....	35	4	5	34
Company A.....	Waterbury.....	64	8	16	56
Company B.....	New Haven.....	53	8	2	59
Company C.....	New Haven.....	58	11	19	50
Company D.....	New Haven.....	57	3	15	45
Company E.....	New Haven.....	62	10	16	56
Company F.....	New Haven.....	52	8	8	52
Company G.....	Waterbury.....	64	2	4	62
Company H.....	Middletown.....	56	10	16	50
Company I.....	Meriden.....	56	3	5	54
Company K.....	Wallingford.....	52	22	19	55
Total.....	.....	609	89	125	573

THIRD REGIMENT.

Field, Staff and Band.....	New London.....	35	8	14	29
Company A.....	Mystic Bridge.....	53	7	13	47
Company B.....	Pawcatuck.....	58	4	12	50
Company C.....	Norwich.....	57	5	14	48
Company D.....	New London.....	53	1	13	41
Company E.....	Willimantic.....	51	20	24	47
Company G.....	Putnam.....	54	12	20	46
Company I.....	New London.....	54	8	1	61
Company K.....	Willimantic.....	53	7	8	52
Total.....	.....	468	72	119	421

FOURTH REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, June 30, 1883.
Field, Staff and Band.....	Bethel	36	1	1	36
Company A.....	Bethel	52	..	2	50
Company B.....	Bridgeport.....	62	12	11	63
Company D.....	South Norwalk.....	64	8	13	59
Company E.....	Bridgeport.....	62	16	17	61
Company F.....	Norwalk.....	51	3	1	53
Company G.....	Danbury.....	63	5	23	45
Company I.....	Winsted.....	56	11	17	50
Company K.....	Stratford.....	55	3	7	51
Total.....	.....	501	59	92	468

FIFTH BATTALION.

Field and Staff.....	Bridgeport.....	6	..	..	6
Company A.....	New Haven.....	66	4	13	57
Company B.....	Hartford	65	3	8	60
Company C.....	Bridgeport.....	60	11	12	59
Total	.....	197	18	33	182

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 13.

ADJUTANT GENERAL'S OFFICE, HARTFORD, July 14, 1883.

I. Brigadier-General Stephen R. Smith, commanding the Connecticut National Guard, will assemble the four regiments and battalion of infantry at the State camp ground, Niantic, Monday, September 10, at 10 o'clock A. M., for six days' camp duty. The battery of artillery will be ordered to report at the camp ground Saturday, September 8, for seven days' camp duty.

Commanding officers will make requisition for transportation at as early a date as practicable.

II. The Quartermaster-General will lay out the camp ground and pitch the tents.

III. The Adjutant-General, the Quartermaster-General, and the Surgeon-General will be present during the entire encampment.

IV. The Commander-in-Chief will review the troops Friday, September 14.

V. Encampments of the National Guard are held under authority of law, for the purpose of instruction in camp and field duties; it is therefore expected and required that every officer and enlisted man will be present in camp and perform the whole tour of duty.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 14.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, August 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of July, 1883:

RESIGNED AND DISCHARGED.

Second Regiment.

Captain Frank R. White, Company A, July 25, 1883.
Second Lieutenant John H. Reid, Company G, July 12, 1883.

Third Regiment.

Captain Charles F. Chaney, Adjutant, July 23, 1883.
Second Lieutenant Timothy Connor, Company E, July 17, 1883.
Second Lieutenant Henry A. Larkin, Company K, July 19, 1883.

Fourth Regiment.

Captain Charles Wilcoxson, Company K, July 18, 1883.
First Lieutenant Sherman H. Hubbard, Signal Officer, July 26, 1883.
First Lieutenant George W. Wheeler, Company A, July 17, 1883.

PROMOTED AND APPOINTED.

First Regiment.

Second Lieutenant George O. McLean, appointed First Lieutenant Company E, with rank from June 22, 1883, *vice* Hemenway, resigned.

First Sergeant Alfred L. Thompson, appointed Second Lieutenant Company E, with rank from June 22, 1883, *vice* McLean, promoted.

Second Regiment.

William E. Jackson, of New Haven, appointed Signal Officer, with rank of First Lieutenant from July 2, 1883—original appointment.

Second Lieutenant John Garrity, appointed First Lieutenant Company C, with rank from June 12, 1883, *vice* Lynn, resigned.

Timothy F. Callahan, of New Haven, appointed Second Lieutenant Company C, with rank from June 12, 1883, *vice* Garrity, promoted.

Third Regiment.

John G. Stanton, of New London, appointed Surgeon, with rank of Major from July 23, 1883, *vice* Carleton, promoted.

Hezekiah B. Smith, of New London, appointed Adjutant, with rank of Captain from July 23, 1883, *vice* Chaney, resigned.

Corporal Thomas O. Thompson, Company I, to be Signal Officer, with rank of First Lieutenant from July 23, 1883—original appointment.

Fourth Regiment.

Second Lieutenant Frank R. Nash, appointed First Lieutenant Company G, with rank from June 25, 1883, *vice* Porter, resigned.

First Sergeant William H. Knowles, appointed Second Lieutenant Company G, with rank from June 25, 1883, *vice* Nash, promoted.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, July 31, 1883.
Captain and N.-C. Staff		5	..	1	4
First Platoon	Guilford	34	1	5	30
Second Platoon	Clinton	37	..	..	37
Total		76	1	6	71

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	5	7	32
Company A	Hartford	52	12	7	57
Company B	Hartford	60	9	12	57
Company D	New Britain	56	9	15	50
Company E	New Britain	64	15	33	46
Company F	Hartford	60	16	18	58
Company G	South Manchester	57	14	17	54
Company H	Hartford	59	6	10	55
Company K	Hartford	64	11	11	64
Total		506	97	130	473

SECOND REGIMENT.

Field, Staff and Band	Middletown	35	5	11	29
Company A	Waterbury	64	8	17	55
Company B	New Haven	53	8	3	58
Company C	New Haven	58	17	19	56
Company D	New Haven	57	3	16	44
Company E	New Haven	62	12	16	58
Company F	New Haven	52	8	8	52
Company G	Waterbury	64	2	8	58
Company H	Middletown	56	10	19	47
Company I	Meriden	56	3	10	49
Company K	Wallingford	52	24	19	57
Total		609	100	146	563

THIRD REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, July 31, 1883.
Field, Staff and Band.....	New London.....	35	15	18	32
Company A.....	Mystic Bridge.....	53	7	13	47
Company B.....	Pawcatuck.....	58	4	16	46
Company C.....	Norwich.....	57	5	15	47
Company D.....	New London.....	53	1	16	38
Company E.....	Willimantic.....	51	20	27	44
Company G.....	Putnam.....	54	12	22	44
Company I.....	New London.....	54	8	9	53
Company K.....	Willimantic.....	53	7	9	51
Total.....	.....	468	79	145	402

FOURTH REGIMENT.

Field, Staff and Band.....	Bethel.....	36	1	2	35
Company A.....	Bethel.....	52	..	4	48
Company B.....	Bridgeport.....	62	14	11	65
Company D.....	South Norwalk.....	64	8	13	59
Company E.....	Bridgeport.....	62	19	21	60
Company F.....	Norwalk.....	51	3	5	49
Company G.....	Danbury.....	63	5	25	43
Company I.....	Winsted.....	56	11	17	50
Company K.....	Stratford.....	55	3	9	49
Total.....	.....	501	64	107	458

FIFTH BATTALION.

Field and Staff.....	Bridgeport.....	6	..	..	6
Company A.....	New Haven.....	66	5	14	57
Company B.....	Hartford.....	65	4	8	61
Company C.....	Bridgeport.....	60	11	12	59
Total.....	.....	197	20	34	183

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 15.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, August 20, 1883.

I. An Examining Board will convene at Camp Waller, Niantic, on Tuesday, September 11, 1883, at 9 o'clock A. M., for the purpose of examining into the fitness and qualifications of officers of the Connecticut National Guard.

The detail for the Board will be announced in future Special Orders.

Brigadier-General Stephen R. Smith, commanding Connecticut National Guard, will detail an orderly for duty on the Board, at the request of the President of the Board.

Each officer appearing before the Board will be examined in the tactics and his knowledge of the duties of his position. The Board will make return to this office, giving name and rank of all officers examined, with the result of such examination. Officers will also be examined as to their general knowledge of military duties, and the conclusions of the Board thereon will be included in their report.

The President of the Board will notify the commanding officer of each organization of the time at which the officers of his command will report to the Board.

II. The following-named officers are hereby ordered to appear before said Board for examination, in order as follows: Brigade Staff, Battery A, First, Second, Third, Fourth Regiments.

Brigade Staff.

Major Edward S. Hayden, Brigade Commissary; Major Charles L. Burdett, Engineer and Signal Officer.

Battery A.

First Lieutenant Arthur S. Fowler; Second Lieutenant Edward M. Gillette.

First Regiment.

Captain John W. Crane, Inspector of Rifle Practice; Captain Arthur J. Wetherell, Captain Charles E. Thompson, First Lieutenant John Hickey, First Lieutenant Samuel O. Prentice, First Lieutenant William H. McLean, First Lieutenant Thomas W. Gleason, Signal Officer; First Lieutenant George O. McLean, Second Lieutenant James H. Jarman, Second Lieutenant Lucien P. Smith, Second Lieutenant Gilbert P. Hurd, Second Lieutenant Alfred L. Thompson.

Second Regiment.

Captain Bryant A. Treat, Captain John B. Doherty, First Lieutenant William H. Stratton, Paymaster; First Lieutenant Frank T. Lee, First Lieutenant John Garrity, First Lieutenant William E. Jackson, Signal Officer; First Lieutenant Charles E. Hall, Second Lieutenant Theodore H. Sucher, Second Lieutenant John Draine, Second Lieutenant Timothy F. Callahan, Second Lieutenant Michael T. Bradley, Second Lieutenant Frank K. Woolworth.

Third Regiment.

Captain Thomas Foran, Captain Hezekiah B. Smith, Adjutant; First Lieutenant Thomas Ashton, First Lieutenant George H. Spencer, First Lieutenant Thomas O. Thompson, Signal Officer; Second Lieutenant Clinton A. Winslow, Second Lieutenant Patrick Fitzpatrick, Second Lieutenant William A. Church.

Fourth Regiment.

Captain Bruce H. Weller, First Lieutenant Alfred E. Moore, First Lieutenant Frank R. Nash, First Lieutenant Eugene Morehouse, First Lieutenant Powell A. Roberts, First Lieutenant David F. Read, Signal Officer; Second Lieutenant George E. Wright, Second Lieutenant William H. Knowles, Second Lieutenant Irving W. Judson.

III. The Quartermaster-General will provide an office and suitable facilities for the Board.

IV. The Quartermaster-General will issue to the infantry organizations of the Connecticut National Guard the new pattern waist belt, cartridge-box, and bayonet-scabbard adopted by the State, and will call in all cross-belts, waist-belts, cartridge-boxes, and bayonet-scabbards now in the possession of said organizations.

Commanding officers desiring to retain the old pattern equipments in addition to the new pattern, may do so on application to the Quartermaster-General.

By order of the Commander-in-Chief,

D. N. COUCH.
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 16.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, September 1, 1883.

I. Captains of companies will instruct their men to take into camp at the coming encampment of the Connecticut National Guard wide-toed, easy-walking shoes, and one change of thick underclothing.

II. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of August, 1883:

RESIGNED AND DISCHARGED.

Brigade Staff.

Captain Edwin McNeill, Aide-de-Camp, August 17, 1883.

First Regiment.

Major George W. Avery, Surgeon, August 11, 1883.

Second Regiment.

First Lieutenant Clayton H. Redfield, Quartermaster, August 8, 1883.

Fifth Battalion.

First Lieutenant Robert Butler, Company C, August 10, 1883.

PROMOTED AND APPOINTED.

Brigade Staff.

First Lieutenant William H. Stratton, Paymaster Second Regiment, appointed Aide-de-Camp, with rank of Captain from August 17, 1883, *vice* McNeill, resigned.

First Regiment.

First Lieutenant Harmon G. Howe, Assistant Surgeon, appointed Surgeon, with rank of Major from August 17, 1883, *vice* Avery, resigned.

Phineas H. Ingalls, of Hartford, appointed Assistant Surgeon, with rank of First Lieutenant from August 17, 1883, *vice* Howe, promoted.

Second Regiment.

Private Eugene C. Hill, Company F, appointed Quartermaster, with rank of First Lieutenant from August 20, 1883, *vice* Redfield, resigned.

Walter M. Wellman, of New Haven, appointed Paymaster, with rank of First Lieutenant from August 20, 1883, *vice* Stratton, promoted.

First Lieutenant John B. Doherty, appointed Captain Company A, with rank from August 1, 1883, *vice* White, resigned.

Second Lieutenant Charles E. Hall, appointed First Lieutenant Company A, with rank from August 1, 1883, *vice* Doherty, promoted.

First Sergeant Frank K. Woolworth, appointed Second Lieutenant Company A, with rank from August 1, 1883, *vice* Hall, promoted.

First Sergeant Michael T. Bradley, appointed Second Lieutenant Company G, with rank from July 23, 1883, *vice* Reid, resigned.

Third Regiment.

Sergeant Patrick Fitzpatrick, appointed Second Lieutenant Company E, with rank from July 24, 1883, *vice* Connor, resigned.

Corporal William A. Church, appointed Second Lieutenant Company K, with rank from August 2, 1883, *vice* Larkin, resigned.

Fourth Regiment.

David F. Read, of Bridgeport, appointed Signal Officer, with rank of First Lieutenant from August 1, 1883, *vice* Hubbard, resigned.

First Sergeant Powell A. Roberts, appointed First Lieutenant Company A, with rank from July 30, 1883, *vice* Wheeler, resigned.

First Lieutenant Bruce H. Weller, appointed Captain Company K, with rank from July 24, 1883, *vice* Wilcoxson, resigned.

Second Lieutenant Eugene Morehouse, appointed First Lieutenant Company K, with rank from July 24, 1883, *vice* Weller, promoted.

First Sergeant Irving W. Judson, appointed Second Lieutenant Company K, with rank from July 24, 1883, *vice* Morehouse, promoted.

III. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, August 31, 1883.
Captain and N.-C. Staff....	.....	5	..	3	2
First Platoon.....	Guilford.....	34	1	8	27
Second Platoon.....	Clinton.....	37	..	..	37
Total.....	.....	76	1	11	66

FIRST REGIMENT.

Field, Staff, and Band. ..	Hartford.....	34	8	13	29
Company A.....	Hartford.....	52	15	12	55
Company B.....	Hartford.....	60	13	14	59
Company D.....	New Britain.....	56	11	19	48
Company E.....	New Britain.....	64	31	41	54
Company F.....	Hartford.....	60	16	19	57
Company G.....	South Manchester.....	57	14	20	51
Company H.....	Hartford.....	59	12	14	57
Company K.....	Hartford.....	64	11	11	64
Total.....	.....	506	131	163	474

SECOND REGIMENT.

Field, Staff, and Band.....	Middletown.....	35	9	15	29
Company A.....	Waterbury.....	64	18	20	62
Company B.....	New Haven.....	53	8	6	55
Company C.....	New Haven.....	58	17	22	53
Company D.....	New Haven.....	57	10	19	48
Company E.....	New Haven.....	62	12	16	58
Company F.....	New Haven.....	52	9	9	52
Company G.....	Waterbury.....	64	2	12	54
Company H.....	Middletown.....	56	15	20	51
Company I.....	Meriden.....	56	10	10	56
Company K.....	Wallingford.....	52	24	20	56
Total.....	.....	609	134	169	574

THIRD REGIMENT.

Field, Staff, and Band.....	New London.....	35	17	19	33
Company A.....	Mystic Bridge.....	53	7	16	44
Company B.....	Pawcatuck.....	58	4	16	46
Company C.....	Norwich.....	57	5	16	46
Company D.....	New London.....	53	1	16	38
Company E.....	Willimantic.....	51	20	29	42
Company G.....	Putnam.....	54	12	25	41
Company I.....	New London.....	54	8	9	53
Company K.....	Willimantic.....	53	7	15	45
Total.....	.....	468	81	161	388

FOURTH REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, August 31, 1883.
Field, Staff, and Band	Bethel	36	2	3	35
Company A	Bethel	52	3	6	49
Company B	Bridgeport	62	15	12	65
Company D	South Norwalk	64	15	15	64
Company E	Bridgeport	62	20	23	59
Company F	Norwalk	51	12	5	58
Company G	Danbury	63	12	26	49
Company I	Winsted	56	11	23	44
Company K	Stratford	55	10	9	56
Total		501	100	122	479

FIFTH BATTALION.

Field and Staff	Bridgeport	6	1	1	6
Company A	New Haven	66	11	15	62
Company B	Hartford	65	7	11	61
Company C	Bridgeport	60	15	17	58
Total		197	34	44	187

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 17.

ADJUTANT-GENERAL'S OFFICE,
CAMP WALLER,
NIANTIC, September 10, 1883..

I. With sorrow the Commander-in-Chief announces to the National Guard the death of Colonel Joseph J. Sweeney, Assistant Adjutant-General, which occurred at New Haven on the 8th inst.

Colonel Sweeney's period of duty in the service was only of a few months' duration, yet by his quick intelligence and urbanity of manner he showed himself to be well fitted to adorn the post now made vacant by his untimely death.

II. As a mark of respect to the deceased, the officers of the Governor's Staff will wear crape on the left arm and sword-hilt for thirty days. The Adjutant-General's Office will be draped in mourning for the same period.

III. A delegation of such officers of the Governor's Staff as can be spared from their duties in camp, together with one commissioned officer from each regiment, shall attend the funeral.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 18.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, October 1, 1883.

I. Edward M. Graves, of New Haven, is hereby appointed Assistant Adjutant-General, with rank of Colonel.

II. At the coming inspection of State property issued to the Connecticut National Guard, the Quartermaster-General will call in all uniforms, and parts of uniforms, overcoats, knapsacks, arms and equipments, now in the possession of commanding officers, in excess of the number of such articles required to equip the members of each command, according to the maximum membership allowed by orders; and also any and all property not required in the present organization of the military force of the State.

III. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of September, 1883:

RESIGNED AND DISCHARGED.

First Regiment.

Captain Charles B. Erichson, Co. E, September 27, 1883.

PROMOTED AND APPOINTED.

Fifth Battalion.

William H. Donaldson, of Bridgeport, appointed Assistant Surgeon, with rank of First Lieutenant, from August 28, 1883, *vice* Creed, commission revoked.

Second Lieutenant Charles H. Walker, appointed First Lieutenant Co. C, with rank from September 3, 1883, *vice* Butler, resigned.

IV. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, Sept. 30, 1883.
Captain and N.-C. Staff		5	3	3	5
First Platoon	Guilford	34	12	11	35
Second Platoon	Clinton	37	3	..	40
Total		76	18	14	80

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	15	13	36
Company A	Hartford	52	26	14	64
Company B	Hartford	60	14	14	60
Company D	New Britain	56	20	20	56
Company E	New Britain	64	44	42	66
Company F	Hartford	60	16	19	57
Company G	South Manchester	57	26	21	62
Company H	Hartford	59	16	14	61
Company K	Hartford	64	11	11	64
Total		506	188	168	526

SECOND REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, Sept. 30, 1883.
Field, Staff and Band	Middletown	35	16	16	35
Company A	Waterbury	64	19	20	63
Company B	New Haven	53	16	9	60
Company C	New Haven	58	21	22	57
Company D	New Haven	57	11	19	49
Company E	New Haven	62	17	22	57
Company F	New Haven	52	9	9	52
Company G	Waterbury	64	10	12	62
Company H	Middletown	56	16	20	52
Company I	Meriden	56	10	10	56
Company K	Wallingford	52	33	21	64
Total		609	178	180	607

THIRD REGIMENT.

Field, Staff and Band	New London	35	19	19	35
Company A	Mystic Bridge	53	12	16	49
Company B	Pawcatuck	58	12	20	50
Company C	Norwich	57	17	17	57
Company D	New London	53	11	16	48
Company E	Willimantic	51	34	29	56
Company G	Putnam	54	26	30	50
Company I	New London	54	15	9	60
Company K	Willimantic	53	12	16	49
Total		468	158	172	454

FOURTH REGIMENT.

Field, Staff and Band	Bethel	36	3	3	36
Company A	Bethel	52	14	7	59
Company B	Bridgeport	62	15	12	65
Company D	South Norwalk	64	16	15	65
Company E	Bridgeport	62	26	23	65
Company F	Norwalk	51	14	6	59
Company G	Danbury	63	22	26	59
Company I	Winsted	56	25	24	57
Company K	Stratford	55	13	11	57
Total		501	148	127	522

FIFTH BATTALION.

Field and Staff	Bridgeport	6	2	1	7
Company A	New Haven	66	14	15	65
Company B	Hartford	65	8	11	62
Company C	Bridgeport	60	16	17	59
Total		197	40	44	193

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 19.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, October 15, 1883.

I. The following-named officers of the Connecticut National Guard, being reported by the Examining Board convened by General Orders, No. 15, and Special Orders, No. 82, C. S., as having passed a satisfactory examination in military tactics and duties, will be commissioned with rank and date as given herewith:

Brigade Staff.

Major Edward S. Hayden, Brigade Commissary,	Waterbury,	Jan. 23, 1883
Major Chas. L. Burdett, Engineer and Signal Officer,	Hartford,	June 14, 1883
Captain William H. Stratton, Aide-de-Camp,	New Haven,	Aug. 17, 1883

Battery A.

First Lieutenant Arthur S. Fowler, 1st Platoon,	Guilford,	Jan. 22, 1883
Second Lieutenant Edward M. Gillette, 1st Platoon,	Guilford,	Jan. 22, 1883

First Regiment.

Captain Arthur J. Wetherell.	G, Manchester,	Jan. 8, 1883
Captain Charles E. Thompson,	F, Hartford,	Jan. 31, 1883
Captain John W. Crane, Inspector of Rifle Practice,	Hartford,	Mar. 10, 1883
First Lieutenant John Hickey,	G, Manchester,	Feb. 5, 1883
First Lieutenant Samuel O. Prentice,	K, Hartford,	Feb. 19, 1883
First Lieutenant William H. McLean,	H, Hartford,	Apr. 17, 1883
First Lieutenant Thomas W. Gleason, Signal Officer,	Hartford,	June 15, 1883
First Lieutenant George O. McLean,	E, New Britain,	June 22, 1883
Second Lieutenant James H. Jarman,	K, Hartford,	Feb. 19, 1883
Second Lieutenant Lucien P. Smith,	H, Hartford,	Apr. 17, 1883
Second Lieutenant Gilbert P. Hurd,	G, Manchester,	June 4, 1883
Second Lieutenant Alfred L. Thompson,	E, New Britain,	June 22, 1883

Second Regiment.

Captain Bryant A. Treat,	K, Wallingford,	Mar. 1, 1883
Captain John B. Doherty,	A, Waterbury,	Aug. 1, 1883
First Lieutenant Frank T. Lee,	F, New Haven,	Mar. 12, 1883
First Lieutenant John Garrity,	C, New Haven,	June 12, 1883
First Lieutenant William E. Jackson, Signal Officer,	New Haven,	July 2, 1883
First Lieutenant Charles E. Hall,	A, Waterbury,	Aug. 1, 1883
First Lieutenant Eugene C. Hill, Quartermaster,	New Haven,	Aug. 20, 1883
First Lieutenant Water M. Wellman, Paymaster,	New Haven,	Aug. 20, 1883
Second Lieutenant Theodore H. Sucher,	E, New Haven,	Mar. 5, 1883
Second Lieutenant John Draine,	F, New Haven,	Mar. 12, 1883
Second Lieutenant Timothy F. Callahan,	C, New Haven,	June 12, 1883
Second Lieutenant Frank K. Woolworth,	A, Waterbury,	Aug. 1, 1883
Second Lieutenant Michael T. Bradley,	G, Waterbury,	July 23, 1883

Third Regiment.

Captain Thomas Foran,	E, Willimantic,	Dec. 11, 1882
Captain Hezekiah B. Smith, Adjutant,	New London,	July 23, 1883
First Lieutenant Thomas Ashton,	E, Willimantic,	Jan. 23, 1883
First Lieutenant George H. Spencer,	K, Willimantic,	Mar. 24, 1883
First Lieutenant Thos. O. Thompson, Signal Officer,	New London,	July 23, 1883
Second Lieutenant Clinton A. Winslow,	G, Putnam,	April 5, 1883
Second Lieutenant Patrick Fitzpatrick,	E, Willimantic,	July 24, 1883
Second Lieutenant William A. Church,	K, Willimantic,	Aug. 2, 1883

Fourth Regiment.

Captain Bruce A. Weller,	K, Stratford,	July 24, 1883
First Lieutenant Alfred E. Moore,	I, Winsted,	April 21, 1883
First Lieutenant Frank R. Nash,	G, Danbury,	June 25, 1883
First Lieutenant Eugene Morehouse,	K, Stratford,	July 24, 1883
First Lieutenant Powell A. Roberts,	A, Bethel,	July 30, 1883
First Lieutenant David F. Read, Signal Officer,	Bridgeport,	Aug. 1, 1883
Second Lieutenant George E. Wright,	I, Winsted,	April 21, 1883
Second Lieutenant William H. Knowles,	G, Danbury,	June 25, 1883
Second Lieutenant Irving W. Judson,	K, Stratford,	July 24, 1883

II. The following-named officers of the Connecticut National Guard, being found qualified according to law, or having previously passed an examination for a corresponding rank, will be commissioned with rank and date as given herewith :

Brigade Staff.

Lieutenant-Col. Chas. M. Carleton, Medical Director,	Norwich,	June 14, 1883

First Regiment.

Major Arthur L. Goodrich,	Hartford,	Dec. 13, 1882
Major Harmon G. Howe, Surgeon,	Hartford,	Aug. 17, 1883
First Lieutenant Phineas H. Ingalls, Asst. Surgeon,	Hartford,	Aug. 17, 1883

Second Regiment.

Major C. Purdy Lindsley, Surgeon,	New Haven,	Feb. 21, 1883
First Lieutenant Chas. H. French, Asst. Surgeon,	Waterbury,	May 14, 1883

Third Regiment.

Major John G. Stanton, Surgeon,	New London,	July 23, 1883

Fifth Battalion.

First Lieutenant Wm. H. Donaldson, Asst. Surgeon,	Bridgeport,	Aug. 28, 1883

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 20.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, October 30, 1883.

I. In the State Armories there shall be no changes or alterations in the construction of the building whatever, unless done by the authority of the Commander-in-Chief upon the recommendation of the Quartermaster-General.

II. In accordance with Chapter LIV., Public Acts General Assembly, A. D. 1881, the Connecticut National Guard will be mustered between the 14th and 30th days of November (prox.). The commanding officers of the regiments, battalion, and battery will muster their respective commands in person, in the evening, and the same fine for non-attendance will be imposed as for absence from any legally warned parade or encampment. Only those will be mustered as present who are in uniform and in the ranks.

III. Duplicate muster-rolls will be properly made out by commanding officers prior to date of muster, and all recruits will be examined by the Surgeon or Assistant Surgeon, and their enlistment papers forwarded to this office at or before muster. The rolls must account for every commissioned officer and enlisted man whose name appeared on the last muster-roll of the command, and those who have joined the organization since that date, and will contain *all* the information provided for by the muster blanks. Date of appointment and promotion of non-commissioned officers will be given. Particular attention is called to the Notes on back of muster-rolls. In preparing and filling out the rolls a strict conformance with the instructions is required, and commanding officers will be careful to fill out, with exactness, the recapitulation and memoranda.

IV. Dates for muster of the different organizations will be assigned by the mustering officers as soon as possible. The mustering officers will carefully scrutinize the muster-rolls, and see that they are properly filled as required, and forward them to this office as soon as possible after completion of muster.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 21.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, November 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of October, 1883:

RESIGNED AND DISCHARGED.

First Regiment.

First Lieutenant George O. McLean, Co. E, October 20, 1883.

Second Regiment.

Captain Everett O. Shaler, Co. H, October 30, 1883.

Third Regiment.

Captain Daniel G. Arnold, Co. G, October 20, 1883.

Fourth Regiment.

Captain Edward F. Jennings, Co. D, October 31, 1883.

PROMOTED AND APPOINTED.

First Regiment.

Second Lieutenant Alfred L. Thompson, appointed Captain Co. E, with rank from October 3, 1883, *vice* Erichson, resigned.

First Sergeant Thomas A. McConkey, appointed Second Lieutenant Co. E, with rank from October 3, 1883, *vice* Thompson, promoted.

Fifth Battalion.

Quartermaster-Sergeant William Sherman, appointed Second Lieutenant Co. C, with rank from October 2, 1883, *vice* Walker, promoted.

II. Changes in the membership of the Connecticut National Guard have occurred since annual muster, November, 1882, as follows:

BATTERY A.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, Oct. 31, 1883.
Captain and N.-C. Staff		5	3	3	5
First Platoon	Guilford	34	12	11	35
Second Platoon	Clinton	37	3	...	40
Total		76	18	14	80

FIRST REGIMENT.

Field, Staff and Band	Hartford	34	15	13	36
Company A	Hartford	52	26	14	64
Company B	Hartford	60	14	14	60
Company D	New Britain	56	20	20	56
Company E	New Britain	64	44	43	65
Company F	Hartford	60	24	24	60
Company G	South Manchester	57	26	23	60
Company H	Hartford	59	16	14	61
Company K	Hartford	64	11	12	63
Total		506	196	177	525

SECOND REGIMENT.

Field, Staff and Band	Middletown	35	17	16	36
Company A	Waterbury	64	19	20	63
Company B	New Haven	53	16	12	57
Company C	New Haven	58	21	23	56
Company D	New Haven	57	11	20	48
Company E	New Haven	62	17	22	57
Company F	New Haven	52	11	10	53
Company G	Waterbury	64	10	12	62
Company H	Middletown	56	16	21	51
Company I	Meriden	56	10	10	56
Company K	Wallingford	52	33	22	63
Total		609	181	188	602

THIRD REGIMENT.

		Aggregate, Muster, 1882.	Gain.	Loss.	Aggregate, Oct. 31, 1883.
Field, Staff and Band	New London	35	20	19	36
Company A	Mystic Bridge	53	12	16	49
Company B	Pawcatuck	58	13	20	51
Company C	Norwich	57	17	18	56
Company D	New London	53	11	16	48
Company E	Willimantic	51	38	29	60
Company G	Putnam	54	26	31	49
Company I	New London	54	15	9	60
Company K	Willimantic	53	12	23	42
Total		468	164	181	451

FOURTH REGIMENT.

Field, Staff and Band	Bethel	36	3	3	36
Company A	Bethel	52	14	7	59
Company B	Bridgeport	62	15	14	63
Company D	South Norwalk	64	16	18	62
Company E	Bridgeport	62	26	25	63
Company F	Norwalk	51	14	6	59
Company G	Danbury	63	24	26	61
Company I	Winsted	56	26	24	58
Company K	Stratford	55	13	12	56
Total		501	151	135	517

FIFTH BATTALION.

Field and Staff	Bridgeport	6	2	1	7
Company A	New Haven	66	14	15	65
Company B	Hartford	65	8	11	62
Company C	Bridgeport	60	16	17	59
Total		197	40	44	193

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 22.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, November 9, 1883.

I. Hereafter this office will publish monthly, in General Orders, for the months of November, December, January, February, March, April, and May in each year, the figure of merit of each company of infantry and platoon of artillery, Connecticut National Guard, according to the monthly drill reports. The order will be issued on or before the fifteenth of each month, and companies not making returns will be so reported.

II. Company and platoon commanders will hereafter forward to Regimental, Battalion, or Battery Headquarters, monthly reports of drills on blank form No. 3, in *triplicate*, prior to the third day of the next succeeding month to that for which report is made; one copy will be retained at Regimental, Battalion, and Battery Headquarters, and two copies will be forwarded to the Brigadier-General commanding, who will, on or before the eighth day of each month, forward one copy to this office, with such information or remarks as he may deem pertinent thereto.

III. In making reports of drills, commanding officers will report as commissioned or non-commissioned officers only those who have been appointed or warranted in their respective positions, and will be certain that no members are reported present unless they appear in uniform and in the ranks. Men relieved from duty in the ranks, by being detailed or assigned to other duty, will first fall in and answer to roll-call in uniform. Officers will be held strictly accountable for any false returns made.

Regimental, Battalion, and Battery commanders will verify the reports as often as possible, and will assign Field and Staff officers to attend drills when practicable.

IV. The figure of merit of each company will be determined by adding the percentage of membership (based on the maximum number allowed by orders), and the percentage of attendance at drills, to the percentage of the duration of drills in proportion to maximum time, which is hereby required to be five hours each month. The percentage thus obtained will be divided by three, giving the figure of merit.

EXAMPLE.

Maximum number allowed by orders..... 67
Actual membership..... 61
Percentage of membership is..... 91.04

Actual membership, as above..... 61
Average attendance at drills..... 55
Percentage will be..... 90.16

Maximum time required to drill.....5 hours.
Time devoted to drill.....4 hours.
Percentage..... 80.

91.04+90.16+80.=261.20, divided by 3=87.07, figure of merit.

This method is adopted with the object of increasing the attendance at drills, and improving the efficiency of each command, and is expected to stimulate commanding officers to recruit their commands to the maximum number with reliable men who will be present for duty.

V. The standing of companies and platoons in this office will depend on the figure of merit attained.

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 23.

ADJUTANT-GENERAL'S OFFICE.
HARTFORD, November 13, 1883.

I. In accordance with the provisions of Section 9, Chapter I, Title X of the General Statutes, the following persons are appointed Post-Surgeons, to determine exemptions from military duty by the standard of disability prescribed by the Surgeon-General:

HARTFORD COUNTY.

Eli Warner, Hartford; George Clary, New Britain; Edward F. Parsons, Enfield; I. P. Fiske, Southington; Henry C. Bunce, Glastonbury; George F. Lewis, Canton; G. W. Edwards, Granby; Henry E. Way, Bristol; Charles Carrington, Farmington; S. R. Burnap, Windsor Locks; Edward F. Parsons, Thompsonville; Julian N. Parker, Manchester.

NEW HAVEN COUNTY.

Pliny A. Jewett, New Haven; Alfred North, Waterbury; N. Nickerson, Meriden; Thomas B. Jewett, Derby; W. H. Andrews, Milford; G. P. Reynolds, Guilford; J. D. McGaughey, Wallingford; Walter H. Zink, Branford; W. C. Williams, Cheshire; Austin E. May, Naugatuck.

MIDDLESEX COUNTY.

Francis D. Edgerton, Middletown; John H. Grannis, Old Saybrook; M. C. Hazen, Haddam; Nathaniel O. Harris, East Haddam; Charles H. Hubbard, Essex; Edwin Bidwell, Saybrook; S. E. Peck, Clinton.

NEW LONDON COUNTY.

Francis N. Braman, New London; S. L. Sprague, Norwich; E. Frank Coates, Stonington; Seth L. Chase, Colchester; George W. Harris, Old Lyme; William Soule, Griswold; Edwin H. Knowles, North Stonington.

WINDHAM COUNTY.

William A. Lewis, Plainfield; John B. Kent, Putnam; T. Morton Hills, Windham; A. S. Leonard, Woodstock; Samuel Hutchings, Killingly; Lowell Holbrook, Thompson.

TOLLAND COUNTY.

S. G. Risley, Rockville; C. B. Newton, Stafford Springs; Henry S. Dean, South Coventry; Frederick Johnson, Mansfield.

FAIRFIELD COUNTY.

George F. Lewis, Bridgeport; William C. Burke, Jr., Norwalk; William C. Bennett, Danbury; Henry Hungerford, Stamford; William C. Wile, Newtown; Sylvester Mead, Greenwich; William S. Todd, Ridgefield; William G. Brownson, New Canaan; Frank Powers, Westport; Samuel M. Garlick, Fairfield.

LITCHFIELD COUNTY.

Willis J. Beach, Litchfield; William Bissell, Salisbury; James Hine, New Milford; James Welch, West Winsted; Harmon W. Shove, Woodbury; Edward Sanford, Cornwall; William Woodruff, Thomaston.

II. All persons between 18 and 45 years of age, desiring exemption from military duty and commutation tax, by reason of mental or physical disability, must report to one of the post-surgeons for examination, and if found exempt will be furnished with a certificate of exemption, to be filed by them with the selectmen of the town where they are liable to enrollment. Those who were exempted by post-surgeons in 1878, 1879, 1880, 1881, and 1882, and the disability classed as permanent, will not be required to be examined again, unless ordered by the Surgeon-General. Persons not filing their certificate of exemption with the selectmen before the first day of February will be debarred from exemption for the year.

III. Post-Surgeons are required to make exemptions strictly in accordance with the orders of the Surgeon-General, and will on the 1st of February report to him the names of all exempted by them, with town and disability, and the names of all examined and not exempted. The fee for examination will be paid by this office upon the report made to the Surgeon-General.

Blanks for certificates of exemption and reports to Surgeon-General will be supplied from this office.

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 24.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, December 1, 1883.

I. The following changes in the commissioned officers of the Connecticut National Guard have occurred during the month of November, 1883:

RESIGNED AND DISCHARGED.

Fourth Regiment.

Second Lieutenant Frederick E. Bassett, Company A, November 30, 1883.

DIED.

Second Regiment.

Captain Frank W. Tiesing, Company B, November 8, 1883.

PROMOTED AND APPOINTED.

First Regiment.

Second Lieutenant Thomas A. McConkey, appointed First Lieutenant Company E, with rank from October 26, 1883, *vice* McLean, resigned.

Sergeant Fredric C. Wilson, appointed Second Lieutenant Company E, with rank from October 26, 1883, *vice* McConkey promoted.

Second Regiment.

Everett O. Shaler, of Middletown, appointed Captain Company H, with rank from November 6, 1883, *vice* Shaler resigned.

Third Regiment.

Second Lieutenant Clinton A. Winslow, appointed Captain Company G, with rank from November 15, 1883, *vice* Arnold resigned.

Sergeant Ezekiel W. White, appointed Second Lieutenant, with rank from November 15, 1883, *vice* Winslow promoted.

Fourth Regiment.

Nelson Taylor, Jr., of South Norwalk, appointed Captain Company D, with rank from November 9, 1883, *vice* Jennings resigned.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

STATE OF CONNECTICUT.

GENERAL ORDERS, No. 25.

ADJUTANT-GENERAL'S OFFICE, HARTFORD, December 15, 1883.

I. The following is announced as the figures of merit of each organization of the Connecticut National Guard for the month of November, 1883, based on the drill reports for the month:

FIRST REGIMENT.

	Received at Regimental Headquarters.	Number of Drills.	Figure of Merit.
Company A	December 4, 12.00 M	4	88.06
Company B	December 1, 1.00 P.M.	3	83.67
Company D	December 4, 6 00 P.M.	2	63.19
Company E	November 30, 9.00 A.M.	3	84.54
Company F	December 3, 8.30 A.M.	3	89 47
Company G	December 1, 7.00 P.M.	3	78.62
Company H	December 3, 9.00 A.M.	3	76.92
Company K	November 27, 9.00 P.M.	3	82.59
Figure of merit of Regiment			80.88

SECOND REGIMENT.

	Received at Regimental Headquarters.	Number of Drills.	Figure of Merit.
Company A	No report.	.	.....
Company B	December 10, 5.00 P.M.	3	92.10
Company C	December 10, 7.00 P.M.	3	84 18
Company D	December 3, 5.00 P.M.	7	84.88
Company E	December 5, 5.00 P.M.	3	86.18
Company F	December 5, 5.00 P.M.	6	80.94
Company G	No report.	.	.....
Company H	December 3, 5.00 P.M.	2	67.27
Company I	December 1, 1.00 P.M.	4	75.86
Company K	December 5, 5.00 P.M.	4	81.05
Figure of merit of Regiment			65.25

THIRD REGIMENT.

	Received at Regimental Headquarters.	Number of Drills.	Figure of Merit.
Company A	December 10, 10.00 A.M.	3	75.84
Company B	December 11, 7.00 A.M.	4	77.53
Company C	November 28,	5	88.05
Company D	December 4, 7.00 A.M.	4	76.21
Company E	December 6, 12.00 M	5	86.52
Company G	December 11, 4.00 P.M.	4	76.07
Company I	December 11, 7.00 A.M.	4	84.29
Company K	December 5, 10.00 A.M.	4	74.86
Figure of merit of Regiment			79.92

FOURTH REGIMENT.

	Received at Regimental Headquarters.	Number of Drills.	Figure of Merit.
Company A	December 3, 10.30 A.M.	4	74.26
Company B	December 1, 7.00 P.M.	3	76.18
Company D	December 4, 7.15 P.M.	4	73.27
Company E	December 5, 7.15 P.M.	4	91.66
Company F	December 4, 10.30 A.M.	5	84.85
Company G	December 1, 4.20 P.M.	4	79.29
Company I	December 5, 5.30 P.M.	6	88.05
Company K	December 5, 10.30 A.M.	3	66.31
Figure of merit of Regiment			79.23

FIFTH BATTALION.

	Received at Battalion Headquarters.	Number of Drills.	Figure of Merit.
Company A	December 6,	4	88.18
Company B	December 3,	5	87.96
Company C	December 8,	4	87.54
Figure of merit of Battalion			87.89

BATTERY A.

	Received at Battery Headquarters.	Number of Drills.	Figure of Merit.
First Platoon	December 5,	3	80.84
Second Platoon	No report.	.	.....
Figure of merit of Battery			40.42

II. The attention of commanding officers is called to par. II and III, General Orders No. 22, c. s., a strict compliance with which is expected and required. Many company commanders neglected to forward to next immediate headquarters drill reports prior to the 3d inst., as directed. Only drills and parades of companies or battalions in uniform, in compliance with State law and orders, should appear in monthly drill reports. Companies will not receive credit for voluntary parades and business meetings, which should not appear as *drills* in reports. This course is necessary to compute the figure of merit of commands upon an equal basis.

By order of the Commander-in-Chief,

D. N. COUCH,
Adjutant-General.

[CIRCULAR.]

STATE OF CONNECTICUT.

ADJUTANT-GENERAL'S OFFICE,
HARTFORD, November 13, 1883.

The following communications having been received by His Excellency, Governor Waller, are published for the benefit of all concerned:

To His Excellency, Thomas M. Waller, the Governor of Connecticut:

SIR: I have the honor, on behalf of the committeee on the celebration of the one-hundredth anniversary of the Evacuation of the city of New York by the British, earnestly to invite the presence and participation of the regular military organizations of each of the thirteen original States in the ceremonies ordered for this interesting occasion.

Without definite information as to the names of such organizations within your State, or the addresses of their commanding officers, I take leave to request your Excellency to give publicity to this invitation.

Your Excellency will further oblige us by directing that notification be sent to us of such organizations that may accept of this invitation, their probable numbers, and the names of the officers commanding.

I have the honor to be, with great respect,

Your obedient servant,

JOHN COCHRANE, *Chairman.*

To His Excellency, Thomas M. Waller, the Governor of Connecticut:

SIR: I have the honor, on behalf of the committee on the celebration of the Evacuation by the British of the city of New York, to invite a participation in the parade of the veteran military organizations, and the cadets of military schools in your State.

Without information as to the names of these organizations, or of their officers, I would respectfully request that your Excellency will kindly give publicity to this invitation.

We shall be obliged to you if you will give us early information of the numbers of such organizations as will favor us with their presence.

I have the honor to be, with great respect,

Your obedient servant,

JOHN COCHRANE, *Chairman.*

The Brigadier-General commanding the Connecticut National Guard is respectfully informed that the Commander-in-Chief desires that battalion organizations only of his command shall accept the above invitation. General S. R. Smith will please notify this office, as soon as practicable, what troops will attend.

The same is requested of the veteran military organizations and military schools, above referred to.

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

[CIRCULAR.]

STATE OF CONNECTICUT.

ADJUTANT GENERAL'S OFFICE,
HARTFORD, December 6, 1883.

Brigadier-General Stephen R. Smith, Commanding Connecticut National Guard:

DEAR SIR: The Commander-in-Chief directs me to convey to you his thanks for the fine martial appearance which the State troops presented during the Evacuation Day ceremonies, as well as for their unexceptionable good conduct while in New York city.

By order of the Commander-in-Chief,

D. N. COUCH,

Adjutant-General.

REPORT

OF THE

Quartermaster-General

OF THE

STATE OF CONNECTICUT,

TO THE

GENERAL ASSEMBLY,

JANUARY SESSION, 1884.

PRINTED BY ORDER OF THE LEGISLATURE.

HARTFORD, CONN.:
PRESS OF WILEY, WATERMAN & EATON, 354 AND 356 ASYLUM ST.
1884.

AUDITORS' REPORT.

To the Honorable the General Assembly of the State of Connecticut:

The undersigned, Auditors of Public Accounts, hereby certify that we have examined the accounts of Hon. Frank D. Sloat, Quartermaster-General, from December 1st, 1882, to January 11th, 1883, inclusive, compared the vouchers for same, and found them correct, showing a balance due to the State from said department amounting to six hundred and seven dollars and three cents, and that said amount has been returned to the Treasurer of the State as appears by his report.

THOMAS J. RAYMOND, } *Auditors of*
GEO. M. GUNN, } *Public Accounts.*

STATE OF CONNECTICUT,
QUARTERMASTER-GENERAL'S DEPARTMENT,

HARTFORD, CONN., January 11, 1883.

Brigadier-General THOMAS MCMANUS,
Quartermaster-General of Connecticut.

GENERAL:

I have the honor to hand you herewith a statement of the account of this department with the State of Connecticut from the commencement of the fiscal year December 1, 1882, to the period when my official transactions closed January 11, 1883.

I am, with much respect,
Your obedient servant,
FRANK D. SLOAT,
Late Quartermaster-General.

DR. STATE OF CONNECTICUT IN ACCOUNT WITH

1883.			
Jan. 11.	To Amount Expended for	Care Public Property, -	$619.80
	" "	Postage, - - - -	15.12
	" "	Freight and Express, -	49.87
	" "	Office Expenses, - -	55.50
	" "	Contingent, - -	17.00
	CONNECTICUT NATIONAL GUARD.		
	To Amount Expended for	Military Stores and Transportation, - - - - - - -	881.53
	To Amount Expended for	Targets, - - -	3.00
	" "	Uniforms, - - -	7.00
	" "	Uniform Compensation,	10.00
	" "	Band Commutation, -	75.00
	" "	Ammunition, - -	7.00
	" "	Armory Rent, - -	100.00
	" "	Niantic Camp Ground,	609.94
	DECEASED SOLDIERS, SAILORS AND MARINES.		
	To Amount Expended for	Funeral Expenses, -	490.00
	To Balance, - - - - - - - - - -		607.03
			$3,547.79

FRANK D. SLOAT, QUARTERMASTER-GENERAL. Cr.

1882.			
Dec.	1.	By Cash Balance, - - - - - - - -	$482.03
	6.	" on Order from Comptroller, - - -	2,000.00
	29.	" " " - - -	1,000.00
1883.			
Jan.	10.	By Cash from Sales to Officers and Others, - -	65.76
			$3,547.79

PUBLIC PROPERTY RECEIVED, ISSUED, TAKEN UP, EXPENDED, DROPPED AND SOLD FROM DECEMBER 1, 1882, TO JANUARY 1883, BY GENERAL FRANK D. SLOAT, LATE QUARTERMASTER-GENERAL.

RECEIVED FROM PURCHASE.

2,246 Rear Sight Slides.
25 Pounds Powder.

RECEIVED FROM U. S. GOVERNMENT.

1 Set Signal Equipments.

TAKEN UP.

1 Wall Tent.

ISSUED TO CONNECTICUT NATIONAL GUARD.

1 Peabody B. L. R. Musket, Cal. .45.
1 Peabody Musket Bayonet, Cal. .45.
1 Springfield Musket Bayonet, Cal. .45.
62 Knapsacks.
5 Waist Belts.
4 Fatigue Caps.
1 Drum Head, Batter.
1 Drum Cord.

ISSUED TO G. A. R. POSTS.

6 Springfield M. L. R. Muskets, Cal. .58.
6 Springfield M. L. R. Bayonets, Cal. .58.
1 Arm Chest.

EXPENDED AND DROPPED.

42 1-2 Pounds Powder.
44 Marksman's Badges.
17 Twelve-pdr. Cartridge Bags.
17 Friction Primers.

SOLD TO OFFICERS AND OTHERS.

22 Cavalry Overcoats.
3 Infantry Blouses.
4 Cavalry Pistols, old.
9 State Buttons, large.
66 State Buttons, Officers', large.
40 State Buttons, Officers', small.
7 N. C. O. Swords.

AUDITORS' REPORT.

To the Honorable the General Assembly of the State of Connecticut:

The undersigned, Auditors of Public Accounts, have attended to their duties in auditing the accounts of the Quartermaster-General, from January 12th, 1883, to November 30th, 1883, inclusive, and respectfully report:

That we have examined the accounts of the office, and found them correct, and the vouchers for all payments on file, showing a balance due the State of thirty-seven and forty one-hundredths dollars; that the Arsenal buildings, military stores, and all other State property therein appear to have been properly cared for, and we are of the opinion that the duties of the department have been faithfully and efficiently performed.

THOMAS I. RAYMOND, } *Auditors of*
GEORGE M. GUNN, } *Public Accounts.*

AUDITORS' REPORT.

The undersigned Auditors of Public Accounts have examined the accounts of the Quartermaster-General, together with the vouchers therefor on file in his office, with reference to special appropriations made by the last General Assembly for grading camp ground at Niantic, and for building mess houses thereon, and find a balance due the State of twenty and fifty-seven one-hundredths dollars.

THOMAS I. RAYMOND, } *Auditors of*
GEORGE M. GUNN, } *Public Accounts.*

REPORT.

QUARTERMASTER-GENERAL'S OFFICE.

HARTFORD, November 30, 1883.

To the General Assembly of Connecticut:

In conformity with the requirements of the statute, I herewith present the report of this department for the past year, with inventories of all public property under my care, and an account of all moneys received and expended since the last report made to the General Assembly of 1883. I have the honor also to present the report of my immediate predecessor, Brig. Gen. Frank D. Sloat, from December 1st, 1882, to January 11, 1883, when the duties and property of the department were transferred to me.

OFFICE.

In accordance with the suggestion of Gen. Sloat, the business office of the Quartermaster-General has been removed from the Arsenal to the Capitol building. This change was necessary not only for the convenience of the department itself, but also for that of all officers of the National Guard and other parties having business therewith.

GRADING AND MESS BUILDINGS.

The General Assembly of 1883, ordered the Camp Ground at Niantic to be graded, and suitable mess buildings erected, and made appropriations therefor. This work has been performed in a substantial, economical and

satisfactory manner. In case of emergency the camp ground can be utilized as a general rendezvous. and the buildings as barracks, with no delay, and with very little additional expense.

NEW HAVEN AND WATERBURY ARMORIES.

The armories in New Haven and Waterbury were occupied by the respective organizations in these two cities on October 1, of this year. One immediate effect of this change is to relieve the State from the burden of armory rent to the annual amount of $4,605.08.

NEW SIGHTS FOR RIFLES.

Early in the year, the rifles in use by the Connecticut National Guard were furnished with the improved wind gauge rear sight, by order of the Adjutant-General. The expense of the mechanical work, altering, fitting, and attaching the same, amounted to $1,072.36.

INSPECTION.

The annual inspection of the arms, uniforms, and equipments in the possession of the different military and semi-military organizations has been made by me and my assistant, Lieutenant-Colonel J. L. Woodbridge, and the property found to be in as satisfactory and serviceable condition as could be expected, considering the length of time that it has already been in the service.

NEW EQUIPMENTS.

In August last this department obtained from the general government 2,000 sets of new and improved equipments, consisting of Frazier patent cartridge box, waist-belt and steel scabbard, and these have been issued to all the companies of the National Guard, excepting to those of the second regiment.

RIFLE RANGES.

The several rifle ranges in the State were put into efficient condition early in the year, necessitating for this item an outlay of $793.70, which sum includes the cost of constructing the new range at Bridgeport.

SUPPLIES FOR REPAIRS OF RIFLES.

The majority of the National Guard are armed with the Peabody rifle, and as the manufacturers of this weapon (the Providence Tool Company) have discontinued the business, and sold out their material and machinery, this department was obliged to forestall future necessities by purchasing such parts of pieces as would most likely be from time to time required ; the cost of this purchase was $463.50.

UNSETTLED ACCOUNTS OF CITY OF NEW HAVEN AND DELANEY GUARD.

We find on inspection that very many of the items charged to the city of New Haven as appurtenances to the two six-pounder rifled guns loaned by the State to the city twenty-five years ago, are not to be found, and it is impossible to trace them except by conjecture. We have endeavored to adjust the discrepancy with the city of New Haven, and have failed, as our predecessors did before us. The account should be adjusted to correspond with the property on hand, but in the absence of legislative authority this department has no way except by holding the city of New Haven debtor to the State for this deficiency, amounting to $283.71.

The property loaned thirteen years ago to the Delaney Guard, an independent military company of New Haven, was returned in part some years ago, and there is still carried on the books of this department a charge for articles that cannot be found. The value will not exceed five dollars. The company has long gone out of existence,

and the account should be closed: we ask your authority. With these two matters adjusted, the books of this department will show a perfectly accurate report of the standing of every company, organization, and officer in the State, with this department, to the smallest item.

EXPENSES FOR DECEASED SOLDIERS

No headstones for deceased soldiers had been paid for by this department before January 11, 1883. Until April 19, 1883, this expense was borne by this office and amounted to $726.00. The funeral expenses from January 11, 1883 to April 19, 1883, amounted to $1,185.00. Since the last mentioned date, both these expenses have been borne by the Comptroller.

NIANTIC CAMP GROUND.

The annual encampment at Niantic, to which the entire military force of the State was called, required in the necessary preparation of grounds, buildings and conveniences, with suitable regard to the health, safety, and comfort of the men and horses, and the care of public property,—a large expenditure, the greater part of which was in permanent improvements, always necessary, and that will not require repetition. The work has been excellently and economically performed, and the result has been a model encampment and the placing of Connecticut's National Guard at the head of the militia of the country, by the judgment of eminently competent military officers from the U. S. Army, and the militia of several states who paid Camp Waller a visit of inspection. The health of the men and horses was excellent. The satisfaction at all arrangements for convenience and comfort was never so general and could not be surpassed. The losses and injuries to the camp and State property incident to transportation and encampments has been reduced to the lowest possible minimum. The transportation of the troops, horses, cannon, baggage, camp equipage and other necessary property was effected without delay, ac-

cident, loss or confusion. The several railroad officials performed faithfully their contracts with this department. With the exception of a very few out of town companies, that were obliged to return by way of Hartford, all were at their homes before sun-down on the day that the encampment ended, and the delay that did occur to these few organizations on that occasion, was caused by no fault either of themselves or of this department.

The accompanying schedules give the receipts, expenses and the property of this department in detail.

I am, very respectfully,

THOMAS McMANUS,

Quartermaster-General of Connecticut.

DR. STATE OF CONNECTICUT IN ACCOUNT WITH

1883.			
Nov. 30.	To Cash Paid for	Uniform Compensation,	$1,760.00
	" "	Care Public Property,	5,902.12
	" "	Officers' Compensation,	2,242.50
	" "	Care of Arms,	2,362.32
	" "	Freight and Express,	480.45
	" "	Targets,	89.30
	" "	Funeral Expenses,	1,911.00
	" "	Postage,	107.27
	" "	Connecticut National Guard,	7,642.04
	" "	Band Compensation,	218.75
	" "	Niantic Camp Ground,	7,394.24
	" "	Office Expenses,	421.35
	" "	Ammunition,	2,455.15
	" "	Armory Rent,	15,974.99
	" "	Uniforms,	1,129.39
	" "	Rifle Ranges,	1,273.07
	" "	Salute,	66.00
	" "	Contingent,	220.45
	" "	Transportation,	5,527.29
	Balance Cash on hand,		37.40
			$57,215.08

THOMAS McMANUS, QUARTERMASTER-GENERAL. Cr.

1883.			
Jan. 31.	By Cash on Order from Comptroller,	- - -	$2,000.00
Mar. 31.	" " "	- - -	9,000.00
Apr. 30.	" " "	- - -	2,000.00
June 30.	" " "	- - -	3,000.00
July 31.	" " "	- - -	3,000.00
Aug. 31.	" " "	- - -	2,000.00
Sept. 30.	" " "	- - -	30,000.00
Nov. 30.	" " "	- - -	4,500.00
	" Received from Sale of Buttons to Officers,		56.32
	" " Care of Public Property,	-	18.00
	" " Officers' Compensation,	-	269.19
	" " Freight and Express,	-	25.41
	" " Conn. National Guard,	-	350.37
	" " Niantic Camp Grounds,	-	102.99
	" " Ammunition,	- - -	158.65
	" " Armory Rent,	- - -	25.00
	" " Rifle Ranges,	- - -	25.00
	" " Salute,	- - - -	66.00
	" " Transportation,	- -	618.15
			$57,215.08

RECAPITULATION OF RECEIPTS.

DR. QUARTERMASTER-GENERAL'S DEPARTMENT,

1883.			
Nov. 30.	To Amount Expended for Care Public Property,	$5,676.86	
	To Amount Expended for Repairs at Arsenal,	136.86	
	To Amount Expended for Repairs on Uniforms,	70.40	$5,884.12
	To Amount Expended for Office Expenses,		421.35
	To Amount Expended for Postage,		107.27
	" " Freight and Express,		455.04
	To Amount Expended for Contingent,		220.45
	CONNECTICUT NATIONAL GUARD.		
	To Amount Expended for Encampment and Military Stores of Connecticut National Guard,	$5,755.81	
	To Amount Expended for parts Peabody Rifles,	463.50	
	To Amount Expended for Altering Sights,	1,072.36	7,291.67
	To Amount Expended for Transportation,		4,909.14
	To Amount Expended for Uniforms,		1,129.39
	To Amount Expended for Armory Rents,		15,949.99
	To Amount Expended for Officers' Compensation,		1,973.31
	To Amount Expended for Uniform Compensation,		1,760.00
	To Amount Expended for care of Arms,		2,362.32
	To Amount Expended for Targets,		89.30
	To Amount Expended for Ammunition,		2,296.50
	To Amount Expended for Rifle Range Rents,	$454.37	
	To Amount Expended for Rifle Range Buildings and Repairs,	793.70	1,248.07
	To Amount Expended for Band Commutation,		218.75
	To Amount Expended for Niantic Camp Ground,		7,291.25
	FUNERAL EXPENSES.		
	To Amount Expended for Deceased Soldiers,	$1,185.00	
	To Amount Expended for Head Stones,	726.00	1,911.00
	To Balance,		37.40
			$55,556.32

AND DISBURSEMENTS OF THE

FOR THE YEAR ENDING NOVEMBER 30, 1883. Cr.

Nov. 30.	By Amount Received from Order of Comptroller for year ending November 30, 1883, - -	$55,500.00
	By Amount Received from sales to Officers and Others, - - - - - - - - -	56.32
		$55,556.32

DR. STATE OF CONNECTICUT IN ACCOUNT WITH

SPECIAL APPROPRIATION FOR

1883.		
May 30.	To Cash Paid for Grading, - - - - -	$2,479.43
	To Balance, - - - - - - - -	20.57
		$2,500.00

DR. STATE OF CONNECTICUT IN ACCOUNT WITH

SPECIAL APPROPRIATION FOR MESS

1883.		
Nov. 30.	To Cash Paid for Mess Houses, - - - -	$6,000.00

THOMAS McMANUS, QUARTERMASTER-GENERAL. CR.

GRADING NIANTIC CAMP GROUND.

1883.		
May 30.	By Cash, Special Appropriation, - - - -	$2,500.00
		$2,500.00

THOMAS McMANUS, QUARTERMASTER-GENERAL. CR.

HOUSES, NIANTIC, CAMP GROUND.

1883.		
Nov. 30.	By Cash, Special Appropriation, - - - -	$6,000.00

STATE PROPERTY

IN THE

Hands of the Quartermaster-General.

PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS A. CAMP AND GARRISON EQUIPAGE.

| | Wall Tents. | Wall Tent Flies. | Wall Tent Poles, sets. | A Tents. | A Tent Poles, sets. | Marque Tents. | Marque Tent Flies. | Marque Tent Poles, sets. | Chapel Tents. | Chapel Tent Poles, sets. | Tent Pins, large. | Tent Pins, small. | Camp Tables. | Camp Chairs. | Bed Sacks. | Axes. | Axe Helves. | Half Axes. | Pick Axes. | Pick Axe Helves. | Spades. | Shovels. | Mallets. | Candlesticks. | Lanterns. | Wash Basins. | Wood Pails. | Cups, Tinned Iron. | Rakes. | Flag Staff. | Halyards, sets. | Flags, Garrison. | Flags, Storm. | Flags, State. | Drums, Snare. | Drum Heads, Snare. | Drum Heads, Batter. | Drum Slings. | Drum Stick Carriages. | Drum Sticks, pairs. | Drum Covers. | Fifes. | Color Belts. | Skirmishing Bugle. | Bugle Cord and Tassels. | Knapsacks. | Haversacks. | Canteens. | Headquarter Tents and Flies. | Headquarter Tent Poles, sets. | Headquarter Wall Tents and Flies. | Headquarter Wall Tent Poles, sets. | Dippers. | Camp Colors. | Drum Cords. | Snares, sets. | Manure Forks. | Gun Racks. | Camp Desks. | Large Tent Stakes. | Colonel's Tents. | Colonel's Tent Flies. | Colonel's Tent Poles, sets. | Baskets. | Camp Signs, sets. | Mauls and Handles. | Slat Cot Beds. | Splint Seat Arm Chairs. | Splint Seat Rockers. | Single Washstands. | Walnut Extension Tables. | Mirrors. | Woven Wire Beds. | Cot Mattresses, common. | Cotton Top Mattresses. | Duck's Feather Pillows. | Curry Combs. | Horse Brushes. | Hanging Lamps. | Camp Signs, Alphabetical. | Field Glass, Signal Service. | Stretchers, U. S. Army. | Telephone cut out. | Telephone Plug and Cord. | Telephone Porcelain Insulators. |
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PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS D. ORDNANCE AND ORDNANCE STORES.

| | FIELD GUNS AND HOWITZER. | | | | | | | | | | | | ARTILLERY CARRIAGES. | | | | | | | | HARNESS. | ARTILLERY EQUIPMENTS AND IMPLEMENTS. | | | | | | | | | | | |

PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS C. QUARTERMASTER'S STORES.

	Company Chests.	Augers.	Bit Stocks.	Claw Chisels.	Hammers.	Crow Bars.	Marking Pots.	Stencil Plates, sets.	Padlocks, Brass.	Padlocks, Iron.	Guidons, Light Battery, C. N. G.	Guidons, Infantry, C. N. G.	Flags, Rebel, Trophies.	Medicine Chests.	State Color, Old Silk.	Sharpshooter's Badges.	Sharpshooter's Bars.	Marksman's Badges.	Marksman's Bars.	Horse Equipments, sets.	Set Signals.	Telegraph Poles, S. Service.	Color Covers.
Received from Gen. Frank D. Sloat, Jan. 11, 1883,	3	1	11	1	8	3	2	3	16	2	1	..	5	3	1	1	11	....	26	12	1	..	..
Received from Connecticut National Guard,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..	....	....	..	1	..	..
Received from purchase during the year,	..	..	..	..	..	..	..	..	12	..	..	4	..	..	..	10	36	170	190	..	..	54	4
Taken up,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	....	2	..	..	..	..
Total to be accounted for,	3	1	11	1	8	3	2	3	28	2	1	4	5	3	1	17	54	170	218	12	2	54	4
Issued to Connecticut National Guard,	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	12	42	163	192	..	2	..	2
Expended and dropped,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	11	....	26	..	..	..	..
Expended in service of C. N. G.,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	....	..	..	1	..
Total issued, expended and dropped,	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	13	53	163	218	..	2	1	2
Remaining on hand November 30, 1883,	3	1	11	1	8	3	2	3	28	2	1	..	5	3	1	4	1	7	....	12	..	53	2

PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS D. ORDNANCE AND ORDNANCE STORES—Continued.

| | PARTS OF SMALL ARMS AND MISCELLANEOUS IMPLEMENTS. | | |

PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS D. ORDNANCE AND ORDNANCE STORES—Continued.

| | SMALL ARMS AND ACCOUTREMENTS. | | |

PROPERTY RETURN.

THOMAS McMANUS, Quartermaster-General.

CLASS B. CLOTHING.

	Overcoats, Infantry, C. N. G.	Coats, Infantry, C. N. G.	Pants, Infantry, C. N. G.	Blouses, Infantry, C. N. G.	Fatigue Caps, C. N. G.	Helmets, C. N. G.	N. C. O. Sashes.	Chevrons, sets.	Second Regiment Coats.	Second Regiment Pants.	Buttons, State, large.	Buttons, State, small.	Buttons, C. N. G., large.	Buttons, State, Officers', large.	Buttons, State, Officers', small.	Governor's Staff Coat Buttons.	Governor's Staff Vest Buttons.	Blankets, single.	Blankets, double.	Wool Blankets, old.	Scarlet Blankets.	Magenta Blankets.	Blue Blankets.	Blanket Cases.	Overcoat Cases.	Shakos and Pompons.	Fatigue Coats, First Regiment Band.	Chevrons, Quartermaster-Sergeant, gilt.	S. S. Devices, sets.	First Regiment Band Uniforms.	Non-Commissioned Staff First Band Uniforms.	First Regiment Band Waist Belts and Plates.	First Regiment Band Music Pouches.	First Regiment Band Shoulder Belts.	Quartermaster-Sergeant Chevrons, cloth.
Received from Gen. Frank D. Sloat, Jan. 11, 1883,	97	413	409	384	381	366	36	209	1	1	93	78	80	....	122	114	84	74	124	483	441	286	121	43	4	51	..	..	..	..	....	....	..	..	..
Received from Connecticut National Guard, .	6	27	25	27	18	28	..	1	..	..	....	....	..	22	6	....	....	....	....	....	....	118	....	..	..	..	..	1	..	..	....	....	..	..	1
Received from purchase during the year, . .	26	4	6	4	33	....	..	....	..	..	432	144	..	216	144	72	72	155	108	....	....	....	....	9	..	25	22	10	84	20	2	21	21	21	54
Taken up, ...	....	....	....	....	....	....	..	....	2	2	....	177	..	....	....	....	34	....	....	....	....	....	....	..	..	..	..	..	..	..	....	....	..	..	..
Total to be accounted for, ...	129	444	440	415	432	394	36	210	3	3	525	399	80	238	272	186	190	229	232	483	441	404	121	52	4	76	22	11	84	20	2	21	21	21	55
Issued to Connecticut National Guard, . .	17	10	12	19	57	8	..	....	1	1	215	207	..	....	....	....	....	....	....	....	....	....	4	..	..	25	22	5	42	20	2	21	21	21	21
Expended and dropped, ...	....	....	....	....	....	....	..	....	..	..	16	....	..	....	82	....	....	....	....	....	....	....	....	..	..	..	..	..	..	..	....	....	..	..	..
Sold to officers and others, ...	....	....	....	....	....	....	..	....	..	..	180	192	..	202	187	34	30	....	....	....	....	....	....	..	..	..	..	..	..	..	....	....	..	..	1
Total issued, expended, dropped and sold,	17	10	12	19	57	8	..	....	1	1	411	399	..	202	269	34	30	....	....	....	....	....	4	..	..	25	22	5	42	20	2	21	21	21	22
Remaining on hand November 30, 1883, . .	112	434	428	396	375	386	36	210	2	2	114	....	80	36	3	152	160	229	232	483	441	404	117	52	4	51	..	6	42	..	....	....	..	..	33

STATE PROPERTY

IN THE

Hands of the Connecticut National Guard.

Brigade Headquarters, C. N. G.

Brigadier-General S. R. Smith, New Haven.

1 Telephone Plug and Cord.
1 " Cut-out.
1 Brigade Flag.
2 Sets Horse Equipments.
2 Shoulder Knots.
2 N. C. Staff Belt Plates.
2 " " Swords.
2 Staff Coats.
2 " Pants.
2 " Caps.
2 Blouses.
2 Overcoats.
1 Field Glass.

First Regiment, C. N. G.

Colonel Lucius A. Barbour, Hartford.

1 Springfield B. L. Rifled Musket, cal. .45.
1 Aiming Tripod.
1 Camp Desk.
21 Band Waist Belts and Plates.
21 Music Pouches.
22 1st Regiment Band Uniforms, complete.
4 N. C. Staff Coats.
4 N. C. Staff Pants.
4 N. C. Staff Blouses.
4 N. C. Staff Helmets.
4 N. C. Staff Fatigue Caps.
4 Infantry Overcoats.
1 Hospital Steward Chevron.
1 Drum-Major Chevron.
1 Quartermaster-Sergeant Chevron.

1 Commissary-Sergeant Chevron.
1 Sergeant-Major Chevron.
1 Regimental Flag, State.
1 " " National.
4 Guidons.
2 Color Belts, black.
1 Color Waist Belt and Plate.
4 Markers.
2 Flag Covers.
1 Signals, set.
2 Color Belts.

Infantry Company A, Hartford, Captain WILLIAM WESTPHAL.

60 Springfield B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
2 Screw Drivers.
63 Cartridge Boxes, new.
63 " " old.
65 Bayonet Scabbards, new.
65 " " old.
65 Waist Belts, new.
65 " " old.
60 Waist Belt Plates.
65 Knapsacks.
1 N. C. O. Sword.
2 Drums.
1 Drum Sling.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
65 1st Regiment Coats.
65 " Pants.
65 " Blouses.
63 " Fatigue Caps.
63 " Helmets.
5 Sergeant Chevrons.
7 Corporal "
62 Infantry Overcoats.
2 Blue Blankets.

2 Arm Chests.
2 Overcoat Cases.
1 Case Equipment Packing.
950 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company B, Hartford, Captain P. J. MORAN.

60 Springfield B. L. Rifled Muskets, cal. .45.
60 " " Musket Bayonets.
1 Spring Vise.
1 Iron Bench Vise.
61 Cartridge Boxes, new.
2 " " old.
60 Bayonet Scabbards
63 Waist Belts.
58 Waist Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
62 1st Regiment Coats.
62 " Pants.
62 " Blouses.
63 " Fatigue Caps.
63 " Helmets.
4 Sergeant Chevrons.
8 Corporal "
63 Infantry Overcoats.
2 Magenta Blankets.
2 Overcoat Cases.
2 Arm Chests.
800 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company D, New Britain, Captain A. N. BENNETT.

63 Springfield B. L. Rifled Muskets, cal. .45.
57 " " " Musket Bayonets.
65 Cartridge Boxes, old.
64 " " new.
66 Bayonet Scabbards, old.
65 " " new.
64 Waist Belts, old.
63 " " new.
65 Waist Belt Plates.
65 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
3 Drum Slings.
3 Drum Sticks, pairs.
1 Fife.
72 1st Regiment Coats.
72 " Pants.
73 " Blouses.
62 " Fatigue Caps.
75 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
63 Infantry Overcoats.
3 Arm Chests.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company E, New Britain, Capt. A. L. THOMPSON.

63 Springfield B. L. Rifled Muskets, cal. .45.
63 " " " Musket Bayonets.
64 Cartridge Boxes.

64 Bayonet Scabbards.
64 Waist Belts.
79 Waist Belt Plates.
64 Knapsacks.
2 Drums.
1 Drum Cover, linen.
3 Drum Sticks, pairs.
3 Drum Slings.
64 1st Regiment Coats.
64 " Pants.
64 " Blouses.
64 " Fatigue Caps.
64 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
63 Infantry Overcoats.
2 Arm Chests.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company F, Hartford, Captain C. E. THOMPSON.

77 Springfield B. L. Rifled Muskets, cal. .45.
77 " " " Musket Bayonets.
64 Cartridge Boxes.
64 Bayonet Scabbards.
79 Waist Belts, old.
64 " " new.
77 Waist Belt Plates.
64 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
2 Drum Covers, linen.
64 1st Regiment Coats.
64 " Pants.

64 1st Regiment Blouses.
64 " Fatigue Caps.
64 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
64 Infantry Overcoats.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company G, So. Manchester, Capt. A. J. WETHERELL.

60 Springfield B. L. Rifled Muskets, cal. .45.
59 " " " Musket Bayonets.
60 Cartridge Boxes.
58 Bayonet Scabbards.
60 Waist Belts.
63 Waist Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
2 Drum Covers, linen.
61 1st Regiment Coats.
60 " Pants.
61 " Blouses.
61 " Fatigue Caps.
64 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
57 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
1 N. C. O. Sword (old pattern.)
1 Overcoat Case.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company H, Hartford, Captain GEO. A. CORNELL.

63 Springfield B. L. Rifled Muskets, cal. .45.
62 " " " Musket Bayonets.
64 Cartridge Boxes.
64 Bayonet Scabbards, new.
2 " " old.
64 Waist Belts.
79 Waist Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
64 1st Regiment Coats.
62 " Pants.
64 " Blouses.
64 " Fatigue Caps.
64 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
64 Infantry Overcoats.
1 Arm Chest.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
4 Magenta Blankets.
2 Sets Signal Service Devices.

Infantry Company K, Hartford, Captain THOMAS M. SMITH.

63 Springfield B. L. Rifled Muskets, cal. .45.
63 " " " Musket Bayonets.
6 Tumbler Punches.
3 Spring Vises.
79 Cartridge Boxes.
79 Bayonet Scabbards.
79 Waist Belts.
79 Waist Belt Plates.

79 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
79 1st Regiment Coats.
78 " Pants.
78 " Blouses.
79 " Fatigue Caps.
79 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
78 Infantry Overcoats.
3 Arm Chests.
2 Overcoat Cases.
705 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Second Regiment.

Colonel Charles P. Graham, Middletown.

1 Peabody B. L. Rifled Musket, cal. .45.
1 Aiming Tripod.
23 Waist Belts.
23 Waist Belt Plates.
1 N. C. Staff Cross Belt.
2 N. C. Staff Cross Belt Plates.
6 Knapsacks.
2 Throgs.
1 Drum.
1 N. C. O. Sword.
1 N. C. Staff Sword.
1 Camp Desk.
25 2d Regiment Coats.
25 " Pants.
3 " Blouses.
4 " Fatigue Caps.

23 2d Regiment Shakos and Pompons.
4 " Epaulettes.
1 Sergeant-Major Chevron.
1 Drum-Major Chevron.
1 Quartermaster-Sergeant Chevron.
1 Commissary Sergeant Chevron.
1 Hospital Steward Chevron.
1 Fife-Major Chevron.
15 Scarlet Blankets.
1 Regimental State Flag.
1 National "
5 Guidons.
2 Color Belts.
2 Color Waist Belts and Plates.
4 Marker Flags.
5 Band Waist Belts and Plates.
25 Music Pouches.
26 Overcoats.
1 Drum-Major's Uniform, complete.
1 Overcoat Case.
1 Set Signals.
1 Drum-Major Bear-skin Hat.
1 " Baldric.
1 " Epaulettes, gilt.
20 Shoulder Knots.
1 Drum-Major Waist Belt, gilt.

Infantry Company A, Waterbury, Captain J. B. DOHERTY.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
6 Screw Drivers.
59 Cartridge Boxes.
59 Cartridge Box Belts.
59 Bayonet Scabbards.
59 Bayonet Scabbard Belts.
60 Waist Belts.

58 Waist Belt Plates.
59 Cross Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
62 2d Regiment Coats.
62 " Pants.
62 " Blouses.
62 " Fatigue Caps.
62 " Shakos and Pompons.
61 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "
57 Scarlet Blankets.
3 Arm Chests.
2 Cases Equipment Packing.
1 Blanket Case.
500 Rounds Ball Cartridges, cal. .45.
62 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons, gilt.
2 Sets Signal Service Devices.

Infantry Company B, New Haven, Captain FRANK W. TIESING.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " Musket Bayonets.
70 Cartridge Boxes.
70 Cartridge Box Belts.
70 Bayonet Scabbards.
70 Bayonet Scabbard Belts.
68 Waist Belts.
70 Waist Belt Plates.
70 Cross Belt Plates.
60 Knapsacks.
1 Throg.

1 N. C. O. Sword.
2 Musicians' Swords.
2 Drums.
4 Drum Slings.
4 Drum Covers, linen.
3 Drum Sticks, pairs.
2 " " Carriages.
1 Fife.
60 2d Regiment Coats.
60 " Pants.
60 " Blouses.
60 " Fatigue Caps.
60 " Shakos and Pompons.
60 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "
60 Scarlet Blankets.
3 Arm Chests.
3 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
60 Overcoats.
2 Overcoat Cases.

Infantry Company C, New Haven, Captain JOSEPH H. KEEFE.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
60 Cartridge Boxes.
60 Cartridge Box Belts.
60 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
59 Waist Belts.
59 Waist Belt Plates.
60 Cross Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.

1 Drum Cover, linen.
2 Drum Sticks, pairs.
65 2d Regiment Coats.
65 " Pants.
65 " Blouses.
65 " Fatigue Caps.
65 " Shakos and Pompons.
65 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "
60 Scarlet Blankets.
3 Arm Chests.
6 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
60 Overcoats.
2 Overcoat Cases.

Infantry Company D, New Haven, Captain L. I. THOMAS.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
60 Cartridge Boxes.
60 Cartridge Box Belts.
60 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
60 Waist Belts.
60 Waist Belt Plates.
60 Cross Belt Plates.
60 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
1 Drum Cover, linen.
1 Drum Sticks, pair.
59 2d Regiment Coats.
59 " Pants.

59 2d Regiment Blouses.
57 " Fatigue Caps.
59 " Shakos.
57 " Pompons.
60 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "
59 Scarlet Blankets.
3 Arm Chests.
2 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
60 Overcoats.
2 Overcoat Cases.

Infantry Company E, New Haven, Capt. H. R. Loomis.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
60 Cartridge Boxes.
60 Cartridge Box Belts.
60 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
60 Waist Belts.
60 Waist Belt Plates.
60 Cross Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
60 2d Regiment Coats.
60 " Pants.
52 " Blouses.
56 " Fatigue Caps.
60 " Shakos and Pompons.
60 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "

60 Scarlet Blankets.
3 Arm Chests.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
60 Overcoats.
2 Overcoat Cases.
1 Quartermaster-Sergeant Chevron, cloth.
1 Set Signal Service Devices.

Infantry Company F, New Haven, Captain GEORGE S. ARNOLD.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
7 Screw Drivers.
70 Cartridge Boxes.
70 Cartridge Box Belts.
70 Bayonet Scabbards.
70 Bayonet Scabbard Belts.
70 Waist Belts.
70 Waist Belt Plates.
70 Cross Belt Plates.
60 Knapsacks.
2 N. C. O. Swords.
1 Musician's Sword.
3 Drums.
3 Drum Slings.
3 Drum Sticks, pairs.
54 2d Regiment Coats.
53 " Pants.
53 " Blouses.
60 " Fatigue Caps.
60 " Shakos and Pompons.
52 " Epaulettes.
5 Sergeant Chevrons.
8 Corporal "
60 Scarlet Blankets.
3 Arm Chests.
2 Cases Equipment Packing.

2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
52 Overcoats.
2 Overcoat Cases.

Infantry Company G, Waterbury, Capt. PATRICK F. BANNON.

60 Peabody B. L. Rifled Muskets, cal. .45.
58 " " " Musket Bayonets.
3 Screw Drivers.
1 Wiper, bristle.
2 Spring Vises.
60 Cartridge Boxes.
60 Cartridge Box Belts.
57 Bayonet Scabbards.
59 Bayonet Scabbard Belts.
63 Waist Belts.
63 Waist Belt Plates.
56 Cross Belt Plates.
63 Knapsacks.
2 Throgs.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
63 2d Regiment Coats.
61 " Pants.
63 " Blouses.
63 " Fatigue Caps.
63 " Shakos and Pompons.
5 Sergeant Chevrons.
8 Corporal "
63 Scarlet Blankets.
3 Arm Chests.
1 Case Equipment Packing.
1 Blanket Case.
500 Rounds Ball Cartridges, cal. .45.

63 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons, gilt.

Infantry Company H, Middletown, Captain E. O. SHALER.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
2 Screw Drivers.
1 Wiper, bristle.
60 Cartridge Boxes.
60 Cartridge Box Belts.
60 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
59 Waist Belts.
58 Waist Belt Plates.
58 Cross Belt Plates.
59 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
3 Drum Sticks, pairs.
65 2d Regiment Coats.
65 " Pants.
62 " Blouses.
65 " Fatigue Caps.
65 " Shakos and Pompons.
59 " Epaulettes.
60 Overcoats.
2 Overcoat Cases.
5 Sergeant Chevrons.
8 Corporal "
57 Scarlet Blankets.
3 Arm Chests.
3 Cases Equipment Packing.
2 Blanket Cases.

500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.
1 Set Quartermaster-Sergeant Chevrons, gilt.

Infantry Company I, Meriden, Captain HENRY B. WOOD.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
5 Screw Drivers.
60 Cartridge Boxes.
60 Cartridge Box Belts.
60 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
60 Waist Belts.
60 Waist Belt Plates.
60 Cross Belt Plates.
60 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
62 2d Regiment Coats.
62 " Pants.
62 " Blouses.
62 " Fatigue Caps.
62 " Shakos and Pompons.
55 " Epaulettes.
62 Overcoats.
2 Overcoat Cases.
5 Sergeant Chevrons.
8 Corporal "
57 Scarlet Blankets.
3 Arm Chests.
1 Case Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company K, Wallingford, Captain B. A. TREAT.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
2 Screw Drivers.
59 Cartridge Boxes.
59 Cartridge Box Belts.
58 Bayonet Scabbards.
60 Bayonet Scabbard Belts.
60 Waist Belts.
73 Waist Belt Plates.
60 Cross Belt Plates.
60 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Sticks, pairs.
64 2d Regiment Coats.
62 " Pants.
63 " Blouses.
60 " Fatigue Caps.
63 " Shakos.
60 " Pompons.
59 " Epaulettes.
60 Overcoats.
2 Overcoat Cases.
5 Sergeant Chevrons.
8 Corporal "
57 Scarlet Blankets.
3 Arm Chests.
1 Case Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
1 N. C. O. Sash.
2 Spring Vises.
1 Set Quartermaster-Sergeant Chevrons, gilt

Third Regiment.

Colonel William H. Tubbs, New London.

1 Peabody B. L. Rifled Musket, cal. .45.
1 Aiming Tripod.
6 Waist Belts.
6 Waist Belt Plates.
6 N. C. Staff Cross Belts.
6 N. C. Staff Cross Belt Plates.
6 N. C. Staff Swords.
1 Drum.
1 Drum Sticks, pair.
1 Bugle, Cord and Tassel.
1 Camp Desk.
26 3d Regiment Coats.
26 " Pants.
26 " Blouses.
26 " Fatigue Caps.
26 " Helmets.
21 " Epaulettes.
21 " Plumes.
26 Infantry Overcoats.
1 Quartermaster-Sergeant Chevron.
1 Commissary-Sergeant Chevron.
1 Hospital Steward Chevron.
1 Fife-Major Chevron.
1 Sergeant-Major Chevron.
1 Regimental Flag, State.
1 " " National
4 Guidons.
2 Color Belts.
2 Color Waist Belts and Plates.
2 Marker Flags.
20 Music Pouches.
20 Band Waist Belts and Plates.
1 Overcoat Case.
1 Set Signals.

Infantry Company A, Mystic, Captain JOHN H. HOXIE.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
8 Tumbler Punches.
2 Spring Vises.
60 Cartridge Boxes, old.
46 " " new.
60 Bayonet Scabbards, old.
46 " " new.
59 Waist Belts, old.
46 " " new.
58 Waist Belt Plates.
59 Knapsacks.
1 N. C. O. Sword.
3 Drums.
3 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
60 3d Regiment Coats.
60 " Pants.
60 " Blouses.
60 " Fatigue Caps.
60 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
54 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
1 Set Quartermaster-Sergeant Chevrons.

Infantry Company B, Pawcatuck, Captain MICHAEL TWOMEY.

59 Peabody B. L. Rifled Muskets, cal. .45.
60 " " Musket Bayonets.

9 Tumbler Punches.
11 Screw Drivers.
3 Spring Vises.
59 Cartridge Boxes, old.
48 " " new.
59 Bayonet Scabbards, old.
48 " " new.
59 Waist Belts, old.
48 " " new.
58 Waist Belt Plates.
60 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
58 3d Regiment Coats.
58 " Pants.
56 " Blouses.
53 " Fatigue Caps.
56 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
56 Infantry Overcoats.
4 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
1 Set Quartermaster-Sergeant Chevrons.

Infantry Company C, Norwich, Captain WILLIAM F. BIDWELL.

60 Peabody B. L. Rifled Muskets, cal. .45.
59 " " " Musket Bayonets.
48 Cartridge Boxes.
47 Bayonet Scabbards.
58 Waist Belts, old.
48 " " new.

57 Waist Belt Plates.
58 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
58 3d Regiment Coats.
59 " Pants.
59 " Blouses.
59 " Fatigue Caps.
57 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
57 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.
1 Set Quartermaster-Sergeant Chevrons.
6 Wipers, bristle.

Infantry Company D, New London, Captain FREDERICK E. ST. CLARE.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
18 Screw Drivers.
6 Tumbler Punches.
3 Spring Vises.
41 Cartridge Boxes, new.
2 " " old.
41 Bayonet Scabbards.
41 Waist Belts.
47 Waist Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
54 3d Regiment Coats.

54 3d Regiment Pants.
54 " Blouses.
54 " Fatigue Caps.
56 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
52 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Set Signal Service Devices.
1 Set Quartermaster Sergeant Chevrons.

Infantry Company E, Willimantic, Capt. THOMAS FORAN.

63 Peabody B. L. Rifled Muskets, cal. .45.
63 " " " Musket Bayonets.
9 Tumbler Punches.
3 Spring Vises.
6 Wipers, bristle.
68 Cartridge Boxes, old
43 " " new.
69 Bayonet Scabbards, old.
43 " " new.
67 Waist Belts, old.
43 " " new.
57 Waist Belt Plates.
70 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
65 3d Regiment Coats.
65 " Pants.
63 " Blouses.
64 " Fatigue Caps.
65 " Helmets.

5 Sergeant Chevrons.
7 Corporal "
62 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
1 Set Quartermaster-Sergeant Chevrons.

Infantry Company G, Putnam, Capt. DANIEL G. ARNOLD.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
2 Tumbler Punches.
1 Spring Vise.
44 Cartridge Boxes.
44 Bayonet Scabbards.
44 Waist Belts.
55 Waist Belt Plates.
60 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Sticks, pairs.
62 3d Regiment Coats.
60 " Pants.
52 " Blouses.
59 " Fatigue Caps.
62 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
57 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
3 Wipers, bristle.

Infantry Company I, New London, Captain A. N. STERRY.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
60 Cartridge Boxes, old.
53 " " new.
60 Bayonet Scabbards, old.
53 " " new.
60 Waist Belts, old.
53 " " new.
60 Waist Belt Plates.
6 Wipers, bristle.
58 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
63 3d Regiment Coats.
63 " Pants.
63 " Blouses.
62 " Fatigue Caps.
62 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
62 Infantry Overcoats.
3 Arm Chests.
2 Cases Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
1 Set Quartermaster-Sergeant Chevrons.
2 Sets Signal Service Devices.

Infantry Company K, Willimantic, Captain C. P. BOYNTON.

55 Peabody B. L. Rifled Muskets, cal. .45.
55 " " " Musket Bayonets.
6 Screw Drivers.
3 Tumbler Punches.

3 Spring Vises.
6 Wipers, bristle.
55 Cartridge Boxes, old.
46 " " new.
55 Bayonet Scabbards, old.
46 " " new.
57 Waist Belts, old.
46 " " new.
53 Waist Belt Plates.
58 Knapsacks.
2 Drums.
2 Drum Slings.
3 Drum Sticks, pairs.
56 3d Regiment Coats.
56 " Pants.
56 " Blouses.
56 " Fatigue Caps.
56 " Helmets.
5 Sergeant Chevrons.
8 Corporal "
56 Infantry Overcoats.
3 Arm Chests.
1 Case Equipment Packing.
2 Overcoat Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.
1 Set Quartermaster-Sergeant Chevrons.

Fourth Regiment.

Colonel George S. Crofut, Bethel.

1 Peabody B. L. Rifled Musket, cal. .45.
5 Waist Belts.
5 Waist Belt Plates.
5 N. C. Staff Swords, new pattern.
3 Infantry Bugles, Cord and Tassels.
1 Aiming Tripod.

1 Camp Desk.
25 4th Regiment Coats.
25 " Pants.
5 " Blouses.
4 " Fatigue Caps.
25 " Helmets.
25 Overcoats.
1 Quartermaster-Sergeant Chevron.
1 Commissary-Sergeant Chevron.
1 Hospital Steward Chevron.
1 Sergeant-Major Chevron.
1 Fife-Major Chevron.
20 Music Pouches.
20 Band Waist Belts and Plates.
1 Regimental Flag, State.
1 " " National
2 Guidons.
4 Marker Flags.
2 Color Belts.
2 Color Waist Belts and Plates.
1 Drum-Major's Coat.
1 " Pants.
1 " Fatigue Cap.
1 " Blouse.
1 " Helmet.

Infantry Company A, Bethel, Captain FREDERICK COLE.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
12 Wipers, bristle.
2 Spring Vises.
5 Screw Drivers.
59 Cartridge Boxes, old.
49 " " new.
59 Bayonet Scabbards, old.
49 " " new.
59 Waist Belts, old.
49 " " new.

59 Waist Belt Plates.
60 Knapsacks.
1 N. C. O. Sword.
2 Drums.
3 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
61 4th Regiment Coats.
61 " Pants.
61 " Blouses.
59 " Fatigue Caps.
60 " Helmets.
60 Overcoats.
2 Overcoat Cases.
5 Sergeant Chevrons.
8 Corporal "
60 Blue Blankets.
3 Arm Chests.
3 Cases Equipment Packing.
1 Blanket Case.
500 Rounds Ball Cartridges, cal. .45.

Infantry Company B, Bridgeport, Captain GEORGE W. CORNELL.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " Musket Bayonets.
10 Wipers, bristle.
60 Cartridge Boxes, old.
60 " " new.
60 Bayonet Scabbards, old.
60 " " new.
62 Waist Belts, old.
60 " " new.
63 Waist Belt Plates.
62 Knapsacks.
1 N. C. O. Sword.
1 Throg.
2 Drums.

2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
62 4th Regiment Coats.
62 " Pants.
63 " Blouses.
63 " Fatigue Caps.
62 " Helmets.
63 Overcoats.
2 Overcoat Cases.
2 Sets Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
62 Blue Blankets.
3 Arm Chests.
4 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
3 Sets Signal Service Devices.

Infantry Company D, South Norwalk, Capt. E. F. JENNINGS.

63 Peabody B. L. Rifled Muskets, cal. .45.
63 " " " Musket Bayonets.
70 Cartridge Boxes, old.
64 " " new.
70 Bayonet Scabbards, old.
64 " " new.
66 Waist Belts, old.
64 " " new.
68 Waist Belt Plates.
70 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
1 Fife.

70 4th Regiment Coats.
70 " Pants.
70 " Blouses.
70 " Fatigue Caps.
70 " Helmets.
63 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
70 Blue Blankets.
3 Arm Chests.
2 Blanket Cases.
1 Case Equipment Packing.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company E, Bridgeport, Captain JAMES SHERIDAN.

63 Peabody B. L. Rifled Muskets, cal. .45.
63 " " " Musket Bayonets.
6 Screw Drivers.
70 Cartridge Boxes, old.
65 " " new.
70 Bayonet Scabbards, old.
65 " " new.
72 Waist Belts, old.
65 " " new.
72 Waist Belt Plates.
73 Knapsacks.
3 Throgs.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
1 Fife.
72 4th Regiment Coats.
72 " Pants.

72 4th Regiment Blouses.
75 " Fatigue Caps.
75 " Helmets.
60 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
73 Blue Blankets.
3 Arm Chests.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company F, Norwalk, Captain ADDISON A. BETTS.

50 Peabody B. L. Rifled Muskets, cal. .45.
50 " " " Musket Bayonets.
6 Screw Drivers.
6 Wipers, bristle.
55 Cartridge Boxes, old.
55 " " new.
56 Bayonet Scabbards, old.
55 " " new.
56 Waist Belts, old.
55 " " new.
56 Waist Belt Plates.
56 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
2 Drum Cords.
56 4th Regiment Coats.
56 " Pants.
56 " Blouses.
56 " Fatigue Caps.

55 4th Regiment Helmets.
54 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
54 Blue Blankets.
3 Arm Chests.
4 Cases Equipment Packing.
2 Blanket Cases.
1500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Infantry Company G, Danbury, Captain CHRISTIAN QUIEN.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
3 Screw Drivers.
1 Tumbler Punch.
1 Spring Vise.
59 Cartridge Boxes, old.
49 " " new.
58 Bayonet Scabbards, old.
49 " " new.
58 Waist Belts, old.
49 " " new.
55 Waist Belt Plates.
55 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
56 4th Regiment Coats.
55 " Pants.
56 " Blouses.
56 " Fatigue Caps.
55 " Helmets.
59 Overcoats.
2 Overcoat Cases.

1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
55 Blue Blankets.
3 Arm Chests.
2 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.

Infantry Company I, Winsted, Captain EDWARD FINN.

60 Peabody B. L. Rifled Muskets, cal. .45.
59 " " " Musket Bayonets.
6 Tumbler Punches.
3 Spring Vises.
3 Wipers, bristle.
70 Cartridge Boxes, old.
50 " " new.
69 Bayonet Scabbards, old.
50 " " new.
66 Waist Belts, old.
50 " " new.
58 Waist Belt Plates.
62 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
1 Fife.
64 4th Regiment Coats.
65 " Pants.
63 " Blouses.
63 " Fatigue Caps.
62 " Helmets.
59 Overcoats.
2 Overcoat Cases.

5 Sergeant Chevrons.
8 Corporal "
59 Blue Blankets.
3 Arm Chests.
1 Case Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.

Infantry Company K, Stratford, Captain B. H. WELLER.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
4 Screw Drivers.
6 Wipers, bristle.
59 Cartridge Boxes.
59 Bayonet Scabbards.
59 Waist Belts.
56 Waist Belt Plates.
60 Knapsacks.
1 Throg.
1 N. C. O. Sword.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
1 Fife.
66 4th Regiment Coats.
65 " Pants.
64 " Blouses.
54 " Fatigue Caps.
65 " Helmets.
60 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
59 Blue Blankets.
4 Arm Chests.

2 Cases Equipment Packing.
2 Blanket Cases.
500 Rounds Ball Cartridges, cal. .45.
2 Sets Signal Service Devices.

Fifth Battalion.

Major Frank M. Welch, Bridgeport.

3 Waist Belts.
3 Waist Belt Plates.
2 Color Belts.
3 N. C. Staff Cross Belts.
3 N. C. Staff Cross Belt Plates.
3 N. C. Staff Swords.
1 Drum.
1 Drum Cover, linen.
1 Drum Sticks, pair.
3 Infantry Coats.
3 " Pants.
3 " Blouses.
3 " Caps.
3 Pompons.
3 Shakos.
1 Regimental Flag, State.
1 " " National.
2 Markers' Flags.
2 Guidons.
1 Quartermaster-Sergeant Chevron.
1 Sergeant-Major Chevron.
1 Drum-Major Chevron.
1 Camp Desk.
3 Infantry Overcoats.
3 Knapsacks.
2 Color Covers.

Infantry Company A, Fifth Battalion, New Haven, Captain GEORGE W. LADIEU.

60 Peabody B. L. Rifled Muskets, cal. .45.
59 " " " Musket Bayonets.
6 Screw Drivers.
5 Tumbler Punches.
3 Spring Vises.
59 Cartridge Boxes, old.
59 " " new.
59 Bayonet Scabbards, old.
59 " " new.
60 Waist Belts, old.
60 " " new.
60 Waist Belt Plates.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
3 Drum Sticks, pairs.
62 Infantry Coats.
62 " Pants.
61 " Blouses.
61 " Fatigue Caps.
62 Shakos.
62 Pompons.
63 Knapsacks.
63 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
3 Arm Chests.
500 Rounds Ball Cartridges, cal. .45.

Infantry Company B, Fifth Battalion, Hartford, Capt. LLOYD G. SEYMOUR.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " Musket Bayonets.

6 Screw Drivers.
2 Tumbler Punches.
2 Spring Vises.
1 Wiper, bristle.
60 Cartridge Boxes.
60 Bayonet Scabbards.
60 Waist Belts.
60 Waist Belt Plates.
62 Knapsacks.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
62 Infantry Coats.
62 " Pants.
62 " Blouses.
62 " Fatigue Caps.
62 Shakos
61 Pompons.
62 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
3 Arm Chests.
1 Case Equipment Packing.
500 Rounds Ball Cartridges, cal. .45.

Infantry Company C, Fifth Battalion, Bridgeport, Capt. Wm. H. Latimer.

60 Peabody B. L. Rifled Muskets, cal. .45.
60 " " " Musket Bayonets.
2 Screw Drivers.
3 Tumbler Punches.
2 Spring Vises.
60 Cartridge Boxes, old.
60 " " new.

60 Bayonet Scabbards, old.
60 " " new.
60 Waist Belts, old.
60 " " new.
60 Waist Belt Plates.
2 Drums.
2 Drum Slings.
2 Drum Covers, linen.
2 Drum Sticks, pairs.
61 Infantry Coats.
60 " Pants.
61 " Blouses.
60 " Fatigue Caps.
61 Shakos.
60 Pompons.
61 Knapsacks.
61 Overcoats.
2 Overcoat Cases.
1 Set Quartermaster-Sergeant Chevrons.
5 Sergeant Chevrons.
8 Corporal "
3 Arm Chests.
1 Case Equipment Packing.
500 Rounds Ball Cartridges, cal. .45.

Battery A, Light Artillery.

Captain Wm. H. Lee, Guilford.

4 Artillery Sabres.
4 Waist Belts and Plates.
4 Spurs, pairs.
1 Quartermaster-Sergeant Chevron.
1 Color-Sergeant Chevron.
1 Veterinary-Sergeant Chevron.

First Platoon Light Artillery, Guilford, Lieut. A. S. Fowler.

2 6-pounder Rifled Bronze Guns, cal. 3.80.
2 " Gun Carriages, complete.

2 6-pounder Gun Caissons.
4 Double Set Wheel Artillery Harness.
4 Double Set Lead Artillery Harness.
2 6-pounder Brass Tompions, Willmot's Patent.
4 6-pounder Rammers.
8 6-pounder Sponges and Covers.
2 Watering Buckets, Gutta Percha.
2 Tar Buckets.
2 Fuze Pouches.
1 " Reamer.
1 " Gouge.
4 Gunner's Haversacks.
2 " Pincers.
1 " Gimlet.
1 " Shears.
2 Vent Punches.
2 Tow Hooks.
2 Thumbstalls.
2 Lanyards.
2 Priming Wires.
4 Handspikes.
2 Paulins, large.
2 Prolonges.
40 Colt's Army Pistols, cal. .45.
33 Screw Drivers.
40 Pistol Holsters.
1 Set Sights for 6 pounder Gun.
37 Artillery Sabres.
32 Artillery Sabre Belts and Plates.
5 McClellan Saddles with Equipments.
1 Skirmishing Bugle.
1 " " Cord and Tassel.
1 Artillery Guidon.
7 Cases Packing.
41 Artillery Coats.
49 " Pants.
41 " Blouses.
40 " Helmets.
38 " Plumes.

38 Artillery Fatigue Caps.
38 Overcoats.
3 Sergeant Chevrons.
4 Corporal "
7 Artillery Jackets.
16 Artillery Blankets.
7 Artillery Whips.
8 Pairs Spurs.
1 Overcoat Case.

Second Platoon Light Artillery, Clinton, Lieutenant HOLCOMB N. JONES.

2 6 pounder Rifle Bronze Guns, cal. 3.80.
2 " Carriages, complete.
2 " Caissons.
3 " Sponges and Rammers.
4 " Sponge Covers.
2 " Worms and Staves.
4 Handspikes.
2 Prolonges.
2 Sponge Buckets.
2 Watering " Gutta Percha.
4 Gunner's Haversacks.
2 Fuze Pouches.
2 " Reamers.
2 " Gouges.
1 Thumbstall.
2 Tow Hooks.
2 Priming Wires.
2 Lanyards.
2 Gunner's Gimlets.
2 " Shears.
2 Paulins.
2 6-pounder Tompions, brass.
4 Double Sets Wheel Artillery Harness.
4 " Lead Artillery Harness.
7 McClellan Saddles, complete.
16 Artillery Blankets.

5 Spurs, pairs.
40 Artillery Sabres.
40 " Sabre Belts.
39 " Sabre Belt Plates.
8 Cases Equipment Packing.
2 Gunner's Pincers.
1 Artillery Guidon.
1 Skirmishing Bugle, Cord and Tassel.
35 Artillery Coats.
34 " Pants.
39 " Blouses.
40 " Helmets.
40 " Fatigue Caps.
40 " Plumes.
39 Overcoats.
3 Sergeant Chevrons.
5 Corporal "
2 Overcoat Cases.
17 Primers.

STATE PROPERTY

IN THE

Hands of the Governor's Guards.

First Company Governor's Horse Guards, Hartford, Major CHAUNCEY B. BOARDMAN.

69 Artillery Sabres.
67 Colt's Revolvers, cal. .45.
3 Pistol Cases, packing.
79 Saddles.
67 Saddle Cloths.
7 Cases Equipment Packing.
70 Black Enamelled Waist Belts.
70 Waist Belt Plates.
82 Cavalry Overcoats.
3 Overcoat Cases.

Second Company Governor's Horse Guards, New Haven, Major H. H. STRONG.

75 Whitney Navy Pistols.
75 Artillery Sabres.
1 Sabre Belt and Plate.
75 Cavalry Cartridge Boxes.
75 Cavalry Cartridge Box Plates.
75 Saddles.
75 Bridles.
73 Collars.
73 Saddle Cloths.
73 Ball Moulds.
69 Cone Wrenches.
6 Coats.
6 Pants.
1 Pistol Packing Case.
12 Cases Equipment Packing.
66 Black Enamelled Waist Belts.
66 Waist Belt Plates.

First Company Governor's Foot Guards, Hartford, Major J. C. KINNEY.

112 Springfield B. L. Rifled Musket, cal. .45.
112 " " " Musket Bayonets.

4 Drums.
1 Drum Sling.
3 Drum Sticks, pairs.
3000 Rounds Ball Cartridges, cal. .45.
1 State Color, Cord and Tassel.
112 Dark Blue Infantry Overcoats.
4 Overcoat Cases.

Second Company Governor's Foot Guards, New Haven, Captain E. J. MORSE.

69 Peabody B. L. Rifled Muskets, cal. .45.
69 " " " Musket Bayonets.
69 Cartridge Boxes.
69 Cartridge Box Belts.
69 Bayonet Scabbards.
69 Bayonet Scabbard Belts.
69 Waist Belts.
69 Waist Belt Plates.
69 Cross Belt Plates.
1 Throg.
69 Shakos and Pompons.
69 Coats.
69 Pants.
69 Caps.
69 Epaulettes.
1 Case Equipment Packing.
500 Rounds Ball Cartridges, cal. .45.
69 Dark Blue Infantry Overcoats.
69 Magenta Blankets.
2 Overcoat Cases.
1 Blanket Case.

STATE PROPERTY

IN THE

Hands of Independent Military Organizations,

Military Schools,

City of New Haven and Grand Army Posts.

Independent Military Organizations.

Putnam Phalanx, Hartford, Major Freeman M. Brown.

100 Cadet Muskets.
100 " Musket Bayonets.

Quien Cadets, Danbury, Captain Christian Quien.

50 Cadet Muskets.
50 " Bayonets.
6 Wormers.
3 Arm Chests.

Cambridge Guard, Hartford, Captain I. L. Cambridge.

40 Springfield M. L. Rifled Muskets, cal. .58.
40 " " " Musket Bayonets, cal. .58.
2 Arm Chests.

Military Schools.

Wm. H. Russell, *Collegiate and Commercial Institute, New Haven.*

107 Cadet Muskets.
107 Musket Bayonets.
150 Cavalry Cartridge Boxes.
150 " " Box Plates.
150 Cap Pouches and Picks.
150 Cross Belt Plates.
2 6-pounder Smooth Bronze Guns, cal. 3.80.
2 " Gun Carriages, complete.
2 " Gun Caissons.
2 " Brass Tompions, Willmot's Patent.
2 " Sponges and Rammers.
2 Worms and Staves.
4 Handspikes.
2 Sponge Buckets.
2 Tar Buckets.

4 Watering Buckets, leather.
2 Prolonges.
4 Gunner's Haversacks.
2 " Gimlets.
4 Fuze Pouches.
2 Tow Hooks.
4 Thumbstalls.
2 Priming Wires.
2 Lanyards.
2 Paulins, small.
6 Arm Chests.
3 Cases Equipment Packing.

A. S. JARVIS, *Weston Military Institute, Weston.*

75 Cadet Muskets.
75 Cadet Musket Bayonets.
4 Arm Chests.

West Middle School District, Hartford.

75 Cadet Muskets.
74 Cadet Musket Bayonets.
3 Arm Chests.

CITY OF NEW HAVEN.

2 6-pounder Rifled Bronze Guns, cal. 3.80.
2 " Gun Carriages, complete.
2 " Sponges and Rammers.
1 Worm and Stave.
4 Handspikes.
2 Prolonges.
1 Watering Bucket.
2 Priming Wires.
2 Paulins.

Grand Army Posts.

Merriam Post No. 8, *G. A. R., West Meriden.*

25 Springfield M. L. Rifled Muskets, cal. .58.
25 " " " Musket Bayonets.
1 Arm Chest.
1 Case Equipment Packing.

Wadham Post No. 49, *G. A. R., Waterbury.*

12 Springfield M. L. Rifled Muskets, cal. .58.
12 " " " Musket Bayonets.
1 Arm Chest.

Post No. 47, *G. A. R., New London.*

6 Springfield M. L. Rifled Muskets, cal. .58.
6 " " " Musket Bayonets.
1 Arm Chest.

Morton A. Taintor Post, No. 9, *G. A. R., Colchester.*

10 Springfield M. L. Rifled Muskets, cal. .58.
10 " " " Musket Bayonets.
1 Arm Chest.

Isbel Post, No. 43, *G. A. R., Naugatuck.*

25 Springfield M. L. Rifled Muskets, cal. .58.
25 " " " Musket Bayonets.
2 Arm Chests.

Sedgewick Post No. 1, *G. A. R., Norwich.*

20 Springfield M. L. Rifled Muskets, cal. .58.
20 " " " Musket Bayonets.
1 Arm Chest.

Henry C. Merwin Post, No. 52, *G. A. R., New Haven.*

6 Springfield M. L. Rifled Muskets, cal. .58.
6 " " Musket Bayonets.
1 Arm Chest.

Doolittle Post, No. 5, *G. A. R., Cheshire.*

12 Springfield M. L. Rifled Muskets, cal. .58.
12 " " " Musket Bayonets.
1 Arm Chest.

Henry G. Nichols Post, No. 7, *G. A. R., Branford.*

6 Springfield M. L. Rifled Muskets, cal. .55.
6 " " " Musket Bayonets.
1 Arm Chest.

G. W. Thompson Post, No. 13, *G. A. R., Bristol.*

6 Springfield M. L. Rifled Muskets, cal. .58.
6 " " " Musket Bayonets.
1 Arm Chest.

McGregor Post, No. 27, *G. A. R., Danielsonville.*

4 Springfield M. L. Rifled Muskets, cal. .58.
4 " " " Musket Bayonets.
1 Arm Chest.

Robert O. Tyler Post, No. 50, *G. A. R., Hartford.*

8 Springfield M. L. Rifled Muskets, cal. .58.
8 " " " Musket Bayonets.

Post No. 51, *G. A. R., Killingly.*

6 Springfield M. L. Rifled Muskets, cal. .58.
6 " " " Musket Bayonets.
1 Arm Chest.

Post No. 55, *G. A. R., Mystic River.*

8 Springfield M. L. Rifled Muskets, cal. .58.
8 " " " Musket Bayonets.
1 Arm Chest.

Post No. 56, *G. A. R., Thompsonville.*

6 Springfield M. L. Rifled Muskets, cal. .58.
6 " " " Musket Bayonets.
1 Arm Chest.

A. E. Burnside Post, No. 62, *G. A. R., Unionville.*

10 Springfield M. L. Rifled Muskets, cal. .58.
10 " " " Musket Bayonets.
1 Arm Chest.

SIXTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF CONNECTICUT,

FOR THE

Fiscal Year ending November 30, 1883.

Printed by Order of the Legislature.

HARTFORD, CONN.:
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1884.

State of Connecticut.

Office of the State Board of Health,

State House, Hartford, December, 1883.

To His Excellency, T. M. Waller,

Governor of the State of Connecticut.

Sir: In compliance with the laws of this State, I have the honor to present to you the Sixth Annual Report of the State Board of Health and Bureau of Vital Statistics.

Very respectfully,

C. W. CHAMBERLAIN, M.D.,

Secretary and Superintendent of the Registration of Vital Statistics.

MEMBERS OF THE BOARD.

	Term Expires
John S. Butler, M.D., Hartford, President,	1886
Hon. A. C. Lippit, New London,	1886
Hon. A. E. Burr, Hartford,	1888
Grove H. Wilson, M.D., Meriden,	1888
Prof. C. A. Lindsley, M.D., New Haven,	1890
Prof. W. H. Brewer, New Haven,	1890

C. W. Chamberlain, M.D., Hartford, Secretary.

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ERRATA.

Page 64, line 13 from the bottom, read "it is Pettenkofer," instead of "is Pettenkofer," etc.

Page 67, line 16, omit comma after Schlösing.

Page 73, line 3 from the top, read "decompositions," instead of "decomposition."

Page 75, foot note, read *bacillus anthracis*, instead of *anthrasis*.

Page 144, line 9, read "anæmic," instead of "anæmial."

Page 217, second line, after common use, supply "is very great and their manufacture"—this clause was omitted.

Page 269, third paragraph, the decimal point is omitted—read 3.05 miles (three and five one-hundredths), instead of 305 miles.

GENERAL REPORT.

There can scarcely be any plainer evidence of the substantial progress of public Hygiene than the recognition it is receiving from the active, energetic men who plan and manage the myriad complex enterprises of the industrial world. Its principles are accepted and adopted by the shrewd business men, the keen financiers, the practical common sense class, in fine, that class who form their conclusions from results rather than theories, or even scientific demonstrations. When the progress of contagious disease is arrested by prompt and efficient action, like the suppression of typhus fever in New York with less than three hundred deaths instead of ten thousand which would have been the mortality, in comparison with the four thousand deaths of the previous outbreak when the increased population is taken into account, the lesson is plain. When the death rate is lowered so that a city formerly among the unhealthiest becomes one of the healthiest of the country, even furnishing better conditions for health than others much more favorably situated naturally, the practical result is clear. When the average duration of life increases sensibly, as in England, as sanitary laws are enforced, and the reverse conditions exist, where they are neglected or ignored, when such facts as these and others fully as striking, are learned, a lesson is taught that results in permanent impressions, which lead also to intelligent action. When, too, one after another the members of a family sicken and die of diphtheria, and it is found that they have been practically living in the upper story of a cess-pool, as the sink-drain had long emptied under the floor, the moral appears to be plain enough.

The lesson is equally plain when of a large number of persons that have been using the water from the same well, one after another sicken with typhoid fever, and first the nurse, and then

relatives from distant places who have kindly come to care for the sick, are in turn seized; then it is learned that the dejections from a typhoid fever patient, perhaps the first one of the series, as in an instance recently observed, had been carelessly thrown upon a refuse heap near the well, or stored up in an adjacent vault so that the germs percolated through the soil, and carried by the ground-air or the ground-water to this well, were held floating in the clear sparkling water until drank by these people, when their immediate mission was performed. I say immediate, as by multiplying and reproducing its kind in the rapid manner characteristic of these micro-organisms, it is difficult to state to what extent disease production may be carried.

Among all classes of society there is an increasing recognition of the value of obedience to sanitary laws and requirements. The legislators, although too often waiting for a strong pressure for protection, from the enlightened public opinion of their constituents instead of leading the way, have nevertheless shown that they appreciate the value of public hygiene, in the manner in which such subjects are discussed, and in the enactment of more efficient laws for the preservation of the public health. In twenty-eight of the States the importance to the well being of the state of systematic sanitary work has been recognized by the organization of State Boards of Health, and in repeated instances, as time has enabled them to demonstrate to some extent what they can contribute to advance the prosperity and welfare of the state, new powers and increased facilities have been granted, and a few that had only a nominal existence have been quickened into active, earnest work by the grant of the facilities that had been before withheld. Still if it is admitted that the highest development of any community in intellectual culture and morality, as well as in material prosperity and wealth can only be secured in proportion as the essential conditions of health are secured to its citizens, the measures requisite to secure these conditions do not yet receive the attention they merit. In the presence of an epidemic, sanitary legislation can be secured, that should be granted by the sober and enlightened common sense of the law-makers, from the merits and importance of the measure itself.

Still there is progress, as is shown not only in the measures adopted for the treatment of these subjects that concern the whole state and for the establishment of broad and enlightened action

in sanitary matters, which it is the province of the State Board of Health to secure among other no less important duties, but also in the organization of local health boards, and the increased powers and facilities that are asked and granted local health boards. The appeals to the legislature for relief from places that are cursed by local unsanitary conditions, show that the people are alive to the dangers to which they are liable. These unsanitary conditions are often fastened upon them by legal complications that can only be unraveled by legislative action, such as polluted streams, perhaps the result of their own previous unwise action, or that flow through other towns. Instances of such action are afforded by the annual publications of the special acts of our own Legislature as well as elsewhere. also of the grant by request of needed powers and special privileges to local health boards to meet special emergencies. In comparison with the legislation of previous years it is easy to see that some educational influences have been at work.

In many of the towns of the State sanitary ordinances have been passed, some of which will be referred to later, while in others advantage has been taken of the improvement in the manner of organizing town health boards to secure an efficient body that can act promptly and efficiently. In preventing the spread of contagious diseases, if you cannot keep out the specific germ of the disease by quarantine as is done in the case of cholera, and was done in the case of small-pox by the National Board of Health, the next best thing is, to stamp it out on the spot it appears, which can only be done by prompt, decided action. Many an epidemic has been rendered possible by the neglect to destroy the contagion at its inception by disinfection, and to prevent its spread by a prompt isolation of the person that was for the time being the center of infection. The neglect of those cognizant of such cases to report to the proper authorities at once has led to the needless sacrifice of many valuable lives.

It would be possible to go on in this way to a much farther extent, but it is enough for the present purpose to show that the principles of sanitary science are permeating through all classes of society, and while they are sometimes only half comprehended, and the effort is too often made to secure some crude, illy understood and therefore perverted measure, the results upon the whole are most encouraging.

It must not, however, be forgotten that while these various sanitary organizations can safely be trusted to do the work committed to their hands properly and well, that the responsibilities of the individual are not in any wise lessened. As in the biblical direction for every man to set his own house in order, it is the duty of each to see that his surroundings are in a sanitary condition, and that not only does he secure the prompt disposal of the excrementitious waste connected with his own premises, so that he does not again rebreathe it or take into his system by the water he drinks, but also to see to it that he does not compel his neighbor to do this. It is not enough for the conditions of sanitation for him to merely cast his filth beyond his own borders, for if he escape the more direct evils that would result from his own use of polluted air to breathe or water to drink, he is liable to the remoter evils it may enkindle beyond his gates, which, in the shape of an epidemic of some pestilential disease, may and is extremely liable to return and slay him; moreover his remoter neighbor may return the compliment by sending upon him the refuse excluded from his own premises. These relations lead us directly to some of the most complicated problems in sanitary science.

In brief, then, to securet he essential conditions of health the fact already partly stated must be realized by each one, that health is an essential requisite for the highest development and prosperity both of the individual and of the State. As the individual cannot reach the full development of his physical and intellectual nature unless his surroundings, training, and education have been in obedience to sanitary laws, so in the case of the community or State, its greatest prosperity in wealth, intellect, and morals cannot be reached unless it furnish to all within its borders the essential conditions of health.

In many respects sanitary science can be regarded as one of the earliest known, as the Israelites under the legislation of Moses had, for a nomadic people, as perfect a sanitary code as could be devised, including principles that have but recently been incorporated into our sanitary codes. The communicability of diseases of animals to mankind was recognized, and a system of inspection adopted that has down to the present day borne fruit in the physical stamina of the Jewish race. The essential conditions of health cannot as far as they go be better summarized than by Hippocrates—as pure

air, pure water, and unpolluted soil. We might add unadulterated food, drugs, and beverages. The latter appears just now to be especially appropriate, in view of the decision in regard to the vile compound made up of the sweepings of the floors of Chinese factories, and other like delectable ingredients and sold as genuine tea, when it probably contained only a few tea leaves to give it an odor. The injunction upon its sale was dissolved, because if deprived of this the people would resort to worse drinks, or at least this was one of the principal reasons given.

The province of sanitary science is very extensive, as anything that promotes health and longevity comes within its field. The prevention of disease and the protection of life are of course reckoned among the most important of its functions. When we reflect that *one-third* of all the deaths that occur are preventable, that is, result from the lack of efficient sanitation, the relations of health to material prosperity stand out in clear relief. As the same is true of the attendant sickness, estimated by some as high as thirteen cases of sickness for each death, the value of efficient sanitation begins to be seen. The cash value to the State of each life at different periods has been figured out by careful statisticians, and an estimate of the material loss to the State—this drain upon her resources, which is entirely a needless waste—in this manner determined. The average value in cash of each life after the self-supporting age is reached is estimated at one thousand dollars ; one-third the deaths in Connecticut included in this limit would be in round numbers two thousand a year; the annual waste of human life in this State would therefore be two millions of dollars. There are several elements, however, not included; one is the enormous tax upon the material resources of the people the unnecessary sickness involves. The ignorance, poverty, idleness, and even crime that results directly from sickness, to say nothing of the burdens of prolonged ill health and invalidism, are appaling to contemplate. The enterprises abandoned, hopes ruined, and life-long misery entailed when the bread-winner of the family is struck down cannot be estimated in dollars and cents. The rapid decline in self-respect, and in the whole moral tone of a family that have to be assisted by public charity when in health they have been self-supporting, has been carefully watched, and the ease with which the vicious and dangerous classes are recruited from this source, shows how closely sanitary science is related to sociology and poli-

tical economy. There is still another feature; that is, the large percentage of the infantile mortality that is due to unsanitary influences. No class of the population succumb so easily to unsanitary influences or are so depressed by foul air. In fact the infantile mortality is often used as a gauge of the healthfulness of a place. As one-third the total mortality of the State is due to children under five years of age, the additional tax upon the prosperity of the State emphasizes the lessons already taught. Should our farmers allow one-third of the lambs, calves, and other young animals to perish because the proper conditions of life were not supplied, a storm of popular indignation against such cruelty would be awakened, but as it is only human beings that are allowed to perish no attention is excited. Were the poor properly housed this infantile mortality would be very much decreased. The subject of proper dwellings for the poor will be considered at some length later.

Vice and crime are to be expected from the indiscriminate herding of human beings in these tenement houses surrounded by filth on every side. The poor are forced to resort to quarters that the vicious seek by choice, and become in time like them. The blood supply for which the growth and development of all tissues of the body is maintained, impoverished by poor and scanty food, is still farther deteriorated by imperfect aeration, by the polluted air breathed which has previously repeatedly passed through the lungs of others as wretched as themselves, and comes loaded with all the impurities which it has gathered and retained from each.

If no worse, the air is at least deprived of more than half its normal supply of oxygen, and to that extent devitalized, but more often is loaded with the fumes of alcohol and tobacco, and other noxious elements, and contains also the germs of various diseases, as well as the fetid organic vapors that are so offensive and depressing. The rapid decrease of vice and crime, the lessened number of convictions for thefts, immoralities, and all the minor crimes, and proportionately of the greater ones, such as murder also, when for the same class of population sanitary dwellings are provided, has been shown several times to be much more than one-half.

We are thus led to the connection between sanitary science and political economy, which by another road brings us to the relations of public or state hygiene to the well being and prosperity of a

community. In many other ways we are led to see the close dependence of the prosperity of a State, and in fact to a considerable extent its very existence upon the health of its citizens, and the fostering care exercised by the State in securing the essential conditions for a normal existence, and in preventing the contamination of the air, earth, or water.

The educational systems adopted, and the manner in which they are carried out, are so clearly related to the healthy development of the young, and in fact to so great a degree determine what the future citizen shall be, both physically and mentally, that of necessity they, if the results are to be satisfactory, must conform to sanitary laws; so far as they deviate in just that far will the results be unsatisfactory. The evils connected either necessarily or unnecessarily with the methods in present use, show conclusively that here lies a great field for the sanitarian. There are many points in the construction of any plan of education that can be properly settled upon no other than a sanitary basis. The evils that are the greatest are the direct resultant of a disregard of hygienic requirements, the unsanitary surroundings of school-life, and the disregard of the laws of physical and mental development. No provision is made usually in the regular plan of school work for the almost unintermittent muscular activity of the youngest scholars, upon which the proper growth and development of their bodies depends, except when the kindergarten methods are adopted, nor is there at any period of school-life any provision for systematic exercise. The restraints of school-life are in many respects unnatural, and so if absolutely essential some compensation should be provided. Unfortunately field or out-of-door games are not common enough to supply the requirements of the case, not in this country at least. The neglect to take into consideration the natural development of the brain, and to recognize it as the organ of the mind, is the second count.

As a result the mental work demanded is too often in advance of the development of the brain, and when the perceptive faculties are alone to any extent developed, tasks are imposed that involve the powers of abstraction, reflection, and to more or less degree the formation of a logical conclusion. The result is that the mind is stunted and the person rendered dull and stupid. Irreparable mischief to the nervous system has been done, and the natural healthy development of the mental powers is no longer a possi-

bility. The whole individual is forced upon a lower plane than the one he would have occupied, in place of being led by an intelligent training of his mental powers as they were naturally developed to the highest rank his natural endowments would allow. The modern kindergarten system, which to some extent has been engrafted upon our primary school system, recognizes the natural unfolding of the child's mental powers and adopts its methods to physiological principles. It would be a great step in advance were all our primary schools managed thus. Improvement, too, would result in the mental as well as physical powers and capabilities, from the substitution of a systematic physical training as a part of the educational system, for a part of the mental task-work. It is very generally admitted by all teachers that every day the point of mental weariness is reached when the pupils are irritable, and it is hard to get through the allotted hours. This is all wrong, and were some part of the hours now devoted to mental task-work entirely, used in training the hand to execute the mandates of an intelligent will—with the coincident mental training of the faculties involved in selecting the means to secure a desired end—comparison, judgment, observation of qualities of material, as well as the exercise of the muscles cramped by too long confinement, at an age when the exercise of the muscles is an essential condition of their healthy growth and proper development, the results would be so striking that there would be no danger of a return to the old methods. The importance of public hygiene is nowhere more plainly manifest than in its relations to the proper training of the young, to secure to them during the formative period such an education that will develop, not dwarf, their natural endowments, and also to secure such a training among sanitary surroundings in properly ventilated, lighted, and drained buildings, with healthful surroundings, and due regard to the simultaneous development of the body, so that a healthy and vigorous physical system is associated with an intelligent mind, ready and eager to execute its commands. But perhaps this is too much in anticipation of the fuller discussions later.

Thus, in the greater part of the complicated relations of life we are dependent for success, and the proper performance of the varied functions of life, upon a due regard to sanitary principles. That it is one of the most important subjects that can engage the attention of the statesman, and indeed demands the most intelli-

gent and careful consideration that can be given is apparent, as it lies at the very foundation of social prosperity. It is not only concerned in the protection of health directly, by preventing the spread and introduction of pestilence, but it teaches us how to reach the highest development our nature allows, by obedience to its principles. From the individual to families, communities, states, and nations, its laws at each stage are ample and sufficient to secure the highest possible degree of mental, and to a great extent, moral prosperity as well as material blessings. The neglect and disregard of its principles leads to disorder, unhappiness, poverty, misery, and crime. That "health is wealth" is a trite saying, but it involves much more than appears on the cursory perusal. While exceptionally good work has been done under the curse of physical suffering, yet the progress of the world and the front rank among nations has beens ecured by the healthiest, most vigorous people. So, too, the best work in the world has been done by those that joined to an intelligent mind a frame of iron, so to speak. Napoleon, Humboldt, and a multitude of others in every walk and line of human achievement furnish striking examples.

One of the effects of disease must not be left out of the case, that is the deterioration of the physical stamina of a race or people, that results from an undue prevalence of disease. Striking examples of this have been seen in the world's history from time to time. Native and even savage tribes, and the vigorous and lordly masters over wide territories have wasted away, and even perished from off the face of the earth as the result of physical deterioration from an undue amount of sickness.

The irruption of the barbarian tribes, and final destruction of the power of Rome, was to a great extent due to the deterioration of the race from luxurious living, pleasant vices, and a disregard of that hardy, simple, health-giving mode of life that had formerly rendered their cohorts invincible. The insidious undermining of the physical strength of a people that results from disobedience to sanitary laws, has been hindered in this country by the constant immigration of a healthy, vigorous peasantry, which has given renewed vigor to the race in this country. But the fact, nevertheless, remains true that from vicious living and a total disregard of sanitary laws, the specimens of the slender effeminate weaklings that are so held up to ridicule in our comic papers are too often to be seen on our streets. It is also true that our faulty social system

and high-pressure style of living, which commences almost at the cradle and is carried through school-life, to the business world, and even to what is falsely called social relaxation, which ceases to be such when made a business, is not at all conducive to the development of bone and muscle. In a multitude of ways we are led to see the deteriorating effect of sickness upon physical development, individual and social prosperity, and last but not least in the loss of the sense of independence and honor, and the tendency to immorality and crime which is often the direct resultant of the loss of all stimulus for endeavor and the hope of better days.

In all classes of people, whatever their social and political relations may be, the stage of civilization reached, it is stated by a keen observer and close reasoner, may be measured by the care taken in the disposal of their filth, the useless and excrementitious materials that are a necessary product in the maintenance of life, and its many pursuits. That the ideal method is to return to the soil for the nutrition of vegetable life, that which in the ultimate analysis came from it is plainly to be seen.

This being so, any method that deviates from this involves the element of danger, very much in proportion as it departs from this standard. Filth stored up in vaults and cesspools is one of the greatest dangers to health, as it is one of the most common. It is an evil that produces disease and death both in city and country. Should an ingenious enemy of mankind endeavor to construct a system of hidden nurseries of disease germs throughout a State, no better method could have been devised, especially for such diseases as typhoid fever, whose germs not only multiply in such places but are preserved for years, ready to reproduce the disease at any time that chance sends them percolating through the soil to some adjacent water supply, or forming part of the dust of the air, they thus find access to their victims. The conclusions concerning the etiology of cholera from the study of the epidemic of 1873, based upon evidence collected by students of this disease in all countries, illustrate several of these points. As there is some chance that this country may be visited by Asiatic cholera during the coming season, and these facts show also how the disease can be stamped out, a condensed statement of some of the more important may not be out of place.

"The disease is caused by the access to the alimentary canal of a specific organic poison, which poison is developed spontaneously

only in certain parts of India (Hindoostan). The poison is contained in all the excretions of a patient, but does not exist until bacteria are developed, usually after an incubation of three days. If the dejections are dried while they contain these bacteria, the poison may be preserved indefinitely. They may be carried to any distance, and find access to the system by air, food, or water. Favorable conditions for the growth of the poison are found in polluted water, in potable water which contains organic impurities, either animal or vegetable matter in the process of decay, and, if taken into the system, in the intestinal portion of the alimentary canal. The poison is destroyed either by natural processes of growth or by contact with acids. Thus the acid gases of the atmosphere destroy these germs. Perhaps one reason of the peculiar freshness of the air after a severe storm, where the lightning has been frequent, is the destruction of similar impurities by the acid gases formed by its agency."

The most practical of these conclusions are those relating to the destruction of the poison by disinfecting the excretions of a cholera patient immediately with an acid solution. It is also stated that acids counteract the poison in the system. These conclusions are condensed from those of Dr. F. W. Reilly, who drew up the report on the cholera epidemic before mentioned.

One important lesson can also be derived concerning the management of typhoid fever; if the dejections were, as a rule, disinfected, the disease would be far less common. Still, as long as the practice of storing up excrementitious filth in privy vaults and cesspools, with no provisions to prevent soil saturation and the pollution of potable water, so long will there be more or less of typhoid fever, or of some fever closely resembling true typhoid.

The water carriage system, while it has its great conveniences for the people that use it, yet is liable to entail, at least by the methods in use at present, nearly as great evils as it removes. The pollution of streams is a growing evil that ere long will become so great that it will force itself upon the attention of our lawmakers. A considerable number of our cities and towns are already feeling the evil effects of the indiscriminate pouring into our once pure and limpid streams all the excrementitious filth of the growing population and the multitudinous products that are comprehensively classed as manufacturing waste. The defeat of the wise measure for a thorough investigation by competent

authority of this subject last year was a public misfortune. It is possible that the measure may be introduced again. If so, its merits deserve the most careful consideration. It is hardly possible thatit could again be rejected.

In thus taking a general survey of the field, some of the more salient features have been briefly considered; others, to save repetition, will find their place in the succeeding pages. While there are some dark shades to the picture, the light prevail, and the outlook for the future is most cheerful. As State after State wheels into line, and as the few that have created Boards in name only, one by one are awakening to the true value of the organization they have neglected, and as appropriations are increased and special work authorized, the horizon constantly brightens and a new impetus is given by the power of friendly association.

It were not only ungracious but unjust to ignore one of the most potent agencies that has advanced the cause of public hygiene in all lands where its claims are acknowledged,—that is, the influence of woman. In America it is well known a woman was the pioneer in inaugurating systematic and organized work in public hygiene. Through her influence and exertions the Massachusetts State Board of Health was established, and one by one, stimulated by this example by the good work there accomplished and the obvious benefits to the State that resulted, twenty-eight States have availed themselves of this agency to advance the welfare and prosperity of the people within their borders. One by one sanitary principles have been admitted to be true, and slowly the truths have permeated the masses of the people, and when intelligent action has followed this recognition the results have been seen in so striking a manner that it is impossible to deny or gainsay. One has only to look at the increased duration of life in England, for instance, where there has been a longer time to produce the results that are achieved by attention to public hygiene, or the low death rate of a city like Calcutta or Bombay, either in comparison with the former condition of these cities, or better still, in comparison with one of the cities of Ecuador, similarly situated, so far as natural conditions unfavorable to health are concerned, in a low, alluvial plain in a hot climate. In the first-named cities, where the laws of public hygiene are to a great extent enforced, the death rate is about the same as many of our American cities, or less than twenty-six to the thousand, while in the South American city, where filth

abounds, a city reeking in filth, the rate is one hundred and twenty to every thousand inhabitants. When we remember that at the lowest average there are five cases of sickness for every death during the year, the proportion of healthy inhabitants is reduced to a small figure. Many estimate the cases of sickness to each death very much higher, but the picture drawn is dark enough.

It is accounted a terrible slaughter when an army is decimated, that is, one out of ten killed, yet in the case cited the city is more than decimated every year by disease, in this instance more than two-thirds is a waste of life without a question. Higher death rates in India have under British rule been brought down nearly as low as those first cited. One of the worst features of the case is that these are the lurking places of pestilence, from whence it stalks forth over the earth. Such diseases as cholera, the plague, and yellow fever are kept alive in similar places, and it requires the most vigilant attention to the enforcement of quarantine to keep them out of other lands. The sanitary neglect in Havana is a constant menace to the health of this country, and the same is true of other places where yellow fever constantly exists.

It is no less true that the decaying and putrescent filth that is allowed to accumulate in neglected corners, the polluted streams, and the vile morasses where sewage, commingled with decaying vegetation is laid bare to the scorching sun, are constant menaces to the health of the localities near which they exist, and nourish and multiply the germs of disease.

While there has doubtless been more or less sanitary work done since this country was settled, yet it is an undisputable fact that woman led the first crusade against filth, and has been constantly at work in this line ever since. Disease and death are foes to the home; they destroy its peace and comfort, and oftentimes its very existence. What wonder therefore that all the energies of the genius of home should be enlisted against such agencies. Who can estimate by a pecuniary standard the value of happy homes founded with every prospect favorable for the maintenance of useful, well-rounded lives, and the establishment of others of like nature, as under the fostering care of affectionate parents, the foundations of noble characters are laid deep and strong, which have been broken up by the death of the bread-winner, and its inmates scattered to eat the bitter bread of dependence, and warm themselves at another's fireside?

The achievements of women in this field are none the less, because often so undemonstrative. It is the steady, earnest, spirit she brings to this work, undiscouraged by all seeming retrograde steps that inspires the whole work. It is not needful to expatiate upon this subject, but as a full and explicit statement has not appeared upon these pages of the debt we owe to the influence of our co-workers it seemed but fitting that the acknowledgment should be made.

One of the recent measures contemplating a closer union of State Boards of Health for united work that was inaugurated at the last session of the American Public Health Association at Detroit, promises well for future efficiency. The increased activity and the results achieved by the various voluntary sanitary societies, the multiplication and circulation of sanitary journals, are not to be omitted in the general statement of the progress in the cause of public hygiene.

The State Board of Health of Michigan has taken the lead in one of the most desirable methods of popularizing sanitary science in holding sanitary conventions over the State, where local talent is enlisted, aided and directed by members of the State Board. We hope as soon as it is possible to make the necessary arrangements, to commence this system in Connecticut. It would be invidious not to mention the attention public hygiene and healthy living received, among the subjects discussed at the recent session of the State Agricultural Society. The relation of sanitary science to rural prosperity, was certainly recognized in no equivocal manner.

It would be possible to enlarge to an almost indefinite extent upon the indications that show how rapidly the leading principles of sanitary science are becoming popularized, but some of the most important have been mentioned, and in the course of the report of the work of the year, others will become manifest from time to time. The measures most needed for future advances, will also be discussed to some extent. As will be seen upon presentation of the subject facilities for exact experimental study upon atmospheric and telluric agencies in relation to the etiology and prevalence of diseases, stands in the front rank. The measure already mentioned for the study of the pollution of streams in this State, also comes in this category.

GENERAL HEALTH OF THE STATE, 1883.

The year cannot well be considered as a healthful one when considered as a whole, although there have been some features that lessen the unfavorable average considerably. The fact is a very significant one that the sickness and mortality has been largely massed in the cities and large towns. With some exceptions there has not been any unusual amount of ill-health in the country, and as we do not have overcrowding to as marked a degree in the larger places, as many other States, local unsanitary conditions must be added to the atmospheric and climatic influences that have been so unfavorable to health. While there has been no general epidemic that has extended over the State, local epidemics have been very common, some an extension of diseases that were thus prevalent in different parts of the State in 1882, others which were rarely if ever seen in unusual frequency during that year. Malarial diseases have continued to extend over the State, but there are indications that point to their departure from a large part of the area first invaded. It appears as the outbreaks of the disease are studied, that southwestern Connecticut, and the limestone region of the Housatonic are, as has before been stated, a border land between the New England States and the area where malaria is present to about the same extent every year, unless, as is the case with other indigenous diseases it becomes for a time unusually prevalent.

To avoid repetition, other points of interest in the general report of the health of the State will be discussed in connection with the diseases that have prevailed.

PNEUMONIA, LUNG FEVER.

It has been very noticeable since the tables have been kept, which show the prevalence of diseases each month of the year, that while usually the mortality from this disease begins to increase in December, and rarely in November, to any great degree, it is not until January that the increase is very marked. From January to March the deaths and of course the corresponding amount of sickness is the largest of any period during the year. Although rapidly decreasing in frequency during the succeeding spring months, the disease remains quite prominent until early summer, and cases occur throughout the year.

The common idea is, that lung fever is a disease of cold weather, to be guarded against then, but not to be expected at other times.

While it is true that the great majority of cases do then occur, yet it is, as the returns plainly show, not confined to the winter months. That this is largely a constitutional as well as a local disease, as claimed by many parties, seems to be confirmed by this distribution and by some of the varieties of the disease. When people herd into their houses in autumn and early winter, and overcrowding in small quarters commences, one would naturally expect to see the variety resulting from polluted air, what are called the foul air pneumonias.

One need not be, it is true, disappointed in not finding at this time, plenty of disease resulting from foul air. The sensitive lungs of children absorb readily the germs of disease, or are irritated and congested by the constant inhalation of that contaminated and poisoned air that has been polluted by its previous passage through several unhealthy lungs. This subject of rebreathing air over and over again is of so great importance that it will bear iteration and reiteration.

Pneumonia has been increasing in frequency of late, yet it is still a question whether this will permanently continue. There does not seem to be any good reason why it should be expected to do so, as apart from the infective variety we have just briefly mentioned there are no causes known to us, apparently, except climatic ones that should make the increase permanent as in fact climatic influences have been the chief cause of its recent increase.

It hardly appears to be established that our seasons have permanently changed, yet we have of late years had a very great amount of what seems to be unseasonable weather, warm when it should have been cold, and the reverse, and dry when it should have been wet. It does not seem as we live through these years that previous seasons have been so changeable and fickle.

Broncho-Pneumonia, numerically more important however, is another type, perhaps as well thus designated as by any other title, is an insidious disease which, commencing as a common cold or becoming what is commonly called a cold on the lungs, and so continuing for some days, suddenly and almost without warning becomes so severe as to threaten and often destroy life, when but a few hours previous there were no dangerous symptoms recognizable. Or, in cases less rapid, the lung would steadily become filled up, the amount of solidification depending

somewhat upon the amount of the previous bronchitis. When there is a generally diffused bronchitis, and both lungs become filled up, death rapidly ensues. It is such cases that die in a few hours after symptoms of pneumonia first appear in connection with the bronchitis. The most rapid case reported was in twelve hours after any evidence of solidification of the lung was discovered; previously the patient had what is generally termed influenza, but his case was carefully watched, as a near relative had recently died of the same disease which caused close watchfulness for symptoms of pneumonia.

This type was mentioned in the last report, but as it has since rather increased in frequency, and is so treacherous it deserves repeated mention. It is the part of wisdom to prepare for known dangers, and while it is perhaps an axiom that he that leads a quiet, unworried life, and is not continually fretting and stewing has the better chance for a long life, it is also beyond cavil that the latter is not an exemplication of a sanitary method.

If hygienic laws are but understood at the outset and one's surroundings and mode of life conformed, there is the least occasion for worry and anxiety. The friction is caused by a partial comprehension of what is required, and a questioning, half-hearted, following—hence constant anxiety, and the occasion for the sneer that life is not worth such unwearied vigilance and watchfulness. As an example in detail of the two methods, it appears as simple to take a sanitary survey of all the fixtures and conveniences of a new house before occupying it, and to have everything put in proper order, as to move in at once, and detecting a vile odor here and a leak there, after a long discussion to have it rectified and the cause removed, and thereafter to be hunting for dangers continually. Or worse yet, after having one's family broken up by the death of all but one, as in a recent instance, to find these deaths caused by a grave sanitary defect that could easily have been remedied. If one cannot make such a survey satisfactorily there are always those available that can.

To return to the prevalence of pneumonia: the type last mentioned was more commonly reported from January to March, and so far as it can be judged, without the figures to guide, was more prevalent than in 1882. The cases after March were, as far as can be judged, more of the regular type when the disease commences as lung fever and proceeds in the usual way by well recog-

nized stages. It will be interesting to see if the increase continues, as for single years before there has been a similar increase, and in 1876 the mortality was a little greater than it has been in any year reported since, except 1882—the returns of 1883 of course are not yet available.

BRONCHITIS.

The subject of broncho-pneumonia naturally leads us to that of bronchitis, as it commences in that form. In England bronchitis causes proportionately many more deaths than we have here from this cause. The proportion, as is the case with nearly all lung diseases, has increased of late, and the disease has become more prominent in the death lists. It is probable that a more careful diagnosis would still further increase the number of deaths from chronic-bronchitis, especially those of old people—now often reported as from consumption, so that the age-ratio of deaths from consumption is rendered much too high. All the deaths returned as consumption in persons over sixty are probably chronic-bronchitis, or from catarrhal pneumonia. The ages at which deaths from consumption occur, should in all probability be rectified by subtracting all such cases. Greater discrimination should be used in reporting. Because a patient has had a cough with expectoration for years it is not proof of consumption, nor is it in the aged, if accompanied with some emaciation, or even a considerable degree. Unless there are the proper physical symptoms of consumption the case should be reported under its proper name. Attention is called to this, to prevent as much as possible such negligence in the future. As there are so many interesting points, and those valuable also in the preservation of life and health that are concerned with the etiology of disease, it is important that exact returns should be made, and every possible source of error eliminated.

CAPILLARY BRONCHITIS.

This disease has also been more frequently met than in previous years. It attacks the very young and very old although much more common in the former. It is a troublesome disease, as children that are attacked early in winter are not apt fully to recover until the succeeding summer, and in the very young it sometimes renders a portion of the lung useless. As can readily be seen, as it is an inflammation of the finest bronchial tubes, the transition to pneu-

monia or inflammation of the lung tissue is easy. At the best it is apt to last quite a time, and relapses and complications are not uncommon.

CATARRHAL DISEASES, TONSILITIS, ETC.

Diseases of the upper-air passages, catarrh and influenza, have been reported quite generally as epidemic at times, now in one place, now in another. They do not appear in the death list, except laryngitis and some diseases of the parts accessory to the production of voice, as tonsilitis or quinsy, and that very seldom. One singular feature was the different times at which these diseases were reported as generally prevalent in different places. This has also been more than usually true of other diseases which have heretofore been prevalent at the same time all over the State. Some instances will be given in their proper connection.

CONSUMPTION.

The climate of New England has gained an unenviable reputation as far as consumption is concerned, although the geographical distribution of the disease is quite general. Still, with this leading our mortality each year, even should a pestilence prevail, it is useless to deny that there are some general conditions peculiarly favorable to this type of disease. It does not appear that, in general, malarial diseases have exerted any influence whatever in increasing the mortality from consumption. They may induce tuberculosis by breaking down the health and vigor in individual cases, but this has not occurred to any such degree as to influence the death rate. During the last six or seven years, or longer, the mortality has not varied essentially, as there was not a difference from year to year of a hundred for quite a period, until 1881. In fact nearly the same percentage has been maintained for many years; it has caused about thirteen per cent. of the mortality from all known causes for some time.

The contagiousness of consumption has been under discussion of late very extensively, and especially in relation to the production of the disease by Koch's *bacillus tuberculosis*. That this microbe is constantly found associated with tubercular consumption any one with a fairly good microscope can ascertain, as when prepared by any of the methods in common use they can be seen by the aid of the objectives usually accompanying a good physician's micro-

scope, as a fifth-inch objective will show them very nicely, and it is also stated that they can be seen by the aid of a four-tenth inch objective, but this I have not verified.

It seems to be pretty fairly settled that only twenty-five per cent. of the cases of tubercular consumption are due to hereditary influences, that is, one-quarter only of those who die from tubercular consumption are descended from parents that had tuberculosis, the larger number by far are produced by agencies that act directly upon the individuals, the most important of which appears to be polluted air. If there were any arguments needed to show the evils of bad air, devitalized by the removal of a part of its oxygen by each pair of lungs through which it passes, and contaminated by the germs of disease, it would be found in the causation of consumption. Such air is also polluted by the products of the decay of molecular life, as a large percentage of the effete matters of the body is discharged through the lungs. Whether or no Koch's *bacillus tuberculosis*, or some other germ, produces consumption, or acts as a carrier from one system to another, the theory seems to be a very satisfactory one.

That is an objection of little moment which is so commonly raised that few are infected in proportion to the number exposed. From what has been said about the causation of tubercular consumption, it, in the first place, does not appear that so very few are infected. Taking the mortality from consumption in Connecticut for the last few years, fourteen hundred each year, and subtracting twenty-five per cent. for heredity, and we have a thousand deaths in each year that can justly be attributed to unsanitary influences. This places consumption among the preventable diseases where sanitarians have been inclined to place it for some time, not depending for this classification upon the germ theory, however, but the fact that it can be thus acquired strengthens the probability of this theory. To this must be added the other diseases induced by impure air; and the ill health and discomfort from minor ailments such as nervous headaches and the like, in order to complete the account of the evils resulting from imperfect ventilation.

In the second place it is not claimed that every one exposed should be infected, nor does every blossom produce fruit. The profusion of blossoms that perfume the spring air seem to have no other function, as even in the most fruitful year, but a very few

out of the mass result in fruition. Nature is prodigal in many respects, although some times the apparently wasted seeds are stored up to reproduce their kind long periods after, when all remembrance of the stock from which they sprung has perished from remembrance. Thus, it is unfortunately with the germs of disease, so it is not strange that we are not always able to trace every case directly to a preceding one, as the germ that produced it may have been lying dormant for years. It is not necessary to resort to the theory of spontaneous generation, because we cannot always trace the connection. We are unable to tell how long under favorable circumstances the vitality of these germs may be maintained; there has been no limit yet discovered. It is true that the life history of these germs of disease or microbes is short, but if the conditions for the successive changes through which they pass are unfavorable, and the process is arrested, vitality is preserved until the favorable conditions are again furnished, when the interrupted cycle is completed, and reproduction is so rapid that the death of successive generations has no restraining effect upon their activity and capacity to induce disease.

Thus, as we have endeavored to teach, in season and out of season, and with reiterated emphasis, the individual element in infective diseases is as important as any other. The seed may be plentiful, but if it does not fall into proper ground it does not grow even if all other conditions are supplied. So, too, whether it be by germs that disease is produced, or whatever the nature of the virus may be, the person must be in a condition of receptivity or else no effect will be produced. If this were not so, in the most contagious diseases all exposed would die, but even in the most devastating plagues every one did not die, nor is every exposure, even if very close, followed by sickness. If it were not for some such wise provisions of a beneficent Creator the race had long since ceased to exist. As the individual element in disease is not fully comprehended, and its bearings realized, it is needful to emphasize its importance even at the expense of repetition. There are some truths that must be kept constantly before the attention of the people until generally accepted. One practical bearing is this, because every one that is exposed does not have scarlet fever, or whatever the disease may be, its contagiousness is denied, and the necessary provisions to prevent the spread of the disease and protect the community are not only not taken by such persons,

but worse still, they become teachers of unbelief and attempt to induce others to follow their teachings, as much less trouble and really just as safe. Much mischief is thus done, as people are too ready to be negligent in sanitary matters. In the presence of epidemics they are terrified, and for a while insist upon the most rigid sanitation, but ere long their watchfulness is relaxed and they become as careless as ever. It is natural to forget past sufferings, but the lessons they teach should not be lost.

SMALL-POX.

There has not been as much small-pox in the State as during 1882, still it appeared in quite a number of places, and generally was managed with the same success as was the rule then. There will be instances where careless and ignorant people will break over all rule and law, and follow their own inclinations in spite of all efforts, until the people generally have become aroused, when the management is made efficient. Of course, it is not always possible to foresee just what point is the one to be most thoroughly looked after, but after some unruly offender breaks bounds, every one can see just what ought to have been done.

The special points of interest, as far as they come to our knowledge, will be given later. The disease was several times introduced by tramps, more often by emigrants, brought up from New York for domestic or out-door service, and a few times by paper rags. This is the principal danger from the latter source, as shown by the investigation made by the Board a few years ago, and perhaps the only one that is liable to occur at any time. As New Haven is the chief port of entry for the State, and one of the three principal ports of entry for rags in the country, as the manufacture of paper is extensively carried on in this State, the chief danger would occur there. The recent action taken by the City Board of Health, requiring disinfection of rags from infected ports, is a proper safeguard, especially as Massachusetts and New York have local regulations on the subject. The Surgeon-General, of the Marine Hospital service, has confirmed the order issued by the New Haven Board, and so far, the danger is anticipated. It is also reported that the principal importers have arranged for disinfection of the rags in Egypt before they are packed in bales. If proper action is not taken by New London, a vessel refused entrance at New Haven might run into New Lon-

don, as one with persons sick with yellow fever on board, when refused admission and ordered into quarantine at New York, did before the present provisions at New London were in existence. If all ports of entry in the State are not yet guarded by similar restrictions, it is here suggested that the matter be provided for before the danger is at hand. As this Board was the first to call the attention of the National Health authorities to this subject several years ago, it behooves us to look out for all possible dangers. As New York and Massachusetts have stringent quarantine regulations, the chances for an attempt to enter, at an unguarded point in this State, are very much increased.

Investigations have been made in regard to the probable origin of small-pox repeatedly, and advice given in regard to the measures to be taken to prevent its spread. The circular on the restriction and prevention of small-pox has been widely circulated, and the third edition issued. The plan for a pest-house is simple, and also provides a place for suspicious cases, where they can be detained until the nature of their disease is known, without submitting them to the small-pox ward, which, however well disinfected, is always a horror to the sick person who is suspected of being a possible source of danger. By very little more expense, a ward for contagious diseases can be added. Every city should have such a ward, if not a separate hospital, and a conveyance for such patients. It seems inhuman to cart a poor sick person all over a city, first here and then there, to be refused admission at every door. To be sure, unless a hospital has an erysipelas ward, it would not be right for them to poison the ward for all the other patients, by receiving a disease that is such a curse to a hospital when it occurs, and is so very difficult to get rid of as erysipelas. Malignant scarlet fever and diphtheria are also illustrations of diseases that should be thus provided for.

That is, in case of strangers suddenly taken ill with a contagious disease, or of domestics, and the mass of the really homeless in any large city — who often suffer hardships, or are provided for at extortionate rates, and grudgingly — a hospital or ward, as the case might require for contagious diseases, would provide the means for their treatment and in addition to its humanitarian aspects furnish a safeguard against the spread of disease. Often with the best disposition in the world a family cannot provide for a person that merely boards under their roof without great danger

to their own family, and great pecuniary loss. There is another point to be considered, that is the danger of spreading a contagious disease by carting the patient all about, and the use of a public carriage too for his conveyance. Until every city has a good and sufficient pest-house, it is perhaps too much to expect a hospital for contagious diseases.

The plan for a pest-house has been widely commended for its sufficiency for the purpose, and the avoidance of unnecessary space, and material to furnish a lodging place for infection. It is for this reason of one story, as the upper would readily become infected and be difficult to thoroughly purify and disinfect.

In fact, Dr. Billings has recently stated in regard to the means of disinfection commonly used in case a contagious disease has been present, that —

"To entirely destroy the vitality of the lower organisms when dry by means of sulphurous acid gas requires a very much longer exposure than is commonly supposed, probably not less than forty-eight hours would be necessary to give entire security."

This is considerably longer than the time usually employed.

There are now no cases of small-pox as far as known in the State, and since last summer there has been scarcely a case, it is safe to say that it has been as infrequent since then as it ever is. There are cases nearly every year, but isolation and vaccination have so often shown their power to control the disease that their prompt enforcement is the rule. It is probable that several years of immunity will in some instances result in neglect of vaccination, as has been the case so often until a threatened epidemic awakens the attention again. It is largely due to the wise foresight of the late Dr. Hawley that Hartford has been so well protected. Every few years when a new set of children had taken the places of those before provided for, a vaccination throughout the schools, and a house to house visitation was enforced largely through his influence, and usually started by him.

In the majority of the cities of the State similar means, or others to secure the same end, have rendered us safe in proportion as this work has been thoroughly done. Every year strengthens the evidence in favor of vaccination, so far as the sanitary history of the State is concerned, while the general amount of proof that is accumulating is overwhelming almost. It is idle to say that the

disease has lost virulence, and is now a tame affair to what it was in former years. When unchecked by vaccination and isolation its ravages are fearful to contemplate. Several instances have occurred that give countenance to the opinion that there is little comparative danger before maturation of the pustules commences, that is before the fifth day of the eruption. Such cases as the following illustrate this: in several instances persons with the eruption fully broken out went about and exposed among others quite a number of unvaccinated persons, yet no cases followed, while a person that made but one visit for necessary articles after the fourth day infected a large percentage of those he met. This is not stated to increase relaxation of quarantine or extension of its limits, but to prevent unnecessay alarm and to explain instances of alleged exposure, where no disease followed, which are used as arguments against isolation and vaccination.

SCARLET FEVER.

Scarlet fever continued to increase in prevalence, and appeared in a large number of the cities and towns of the State. In Hartford and New Britain during the latter part of 1882 and the early part of 1883, there were extensive epidemics, and wherever it appeared it spread rapidly, and was quite generally of a severe and fatal type. In accordance with the history of this disease in the State, it should have been very prevalent during this year and the last, and if the analogy holds good we shall now see a regular decrease, not to the same degree each year, but varying more or less, still a very decided falling off in the mortality indicating also a proportionate decrease in the sickness rate. The decrease has already commenced, and although we have every winter more or less scarlet fever, there is no general prevalence and no epidemic. The cases that are reported are very mild and seldom fatal, unless there has been some local cause to render the type more malignant, so that this disease, which at the commencement of the year was attracting quite general attention, has become of little special interest. As one of the filth diseases, extremely liable to appear when there is neglect of hygienic requirements, and of a contagious nature, it is of importance always, but it is one of the dangers threatening the health of a community that can be controlled by prompt efficient action. The local histories afford many instructive

instances of the manner in which the disease can be spread. The circular on scarlet fever prepared for our last report, and put in circulation when scarlet fever began to be prominent last year, has proved very useful and popular. In addition to those sent out by the Board, where it was thought they would be useful, it has been called for very extensively, manufacturers have sent for sufficient quantities to supply all their operatives, physicians for their patients, and local boards of health for their towns, heads of families have sent for a sufficient quantity for themselves and neighbors. The directions for disinfection and the prevention of contagion extending to others or of its retention for future mischief have been widely useful, and largely carried out. More copies of this for the time it has been issued have been circulated, than of any of our similar publications. Over two thousand copies were circulated, and the first edition was soon exhausted.

There has been considerable *whooping cough* and *measles*, especially in the western and in the southwestern part of the State, while not wholly restricted to that region. There have been epidemics of measles and of whooping cough, but no excessive mortality, the deaths generally resulting from complications, usually some lung affection. There has been one peculiar feature in regard to both scarlet fever and measles, that is the tendency shown to attack those that have had the disease before. Cases of third attacks even are reported. In regard to measles, the second attack has in many instances rapidly succeeded the first seizure, that is, in the same year. Rotheln, or German measles, and roseola have been reported here and there.

WINTER CHOLERA.

This is a new disease to this State. As far as I can learn it appeared first, in New England, in Providence, R. I. It is an epidemic disease, with so far no well defined cause, the reasons for its prevalence are as yet undiscovered. It is a winter diarrhea with some symptoms similar to cholera; a cold stage with more or less sinking or collapse. Thus far it has been reported only from cities, and appeared first in several western cities. In this State it was reported from Waterbury. The cases last about a week, are rarely if ever fatal, and seldom leads to inflammatory or chronic diseases. In one instance it was attributed to a poor article of butterine, that is, this was supposed to be the cause of one epidemic,

but as no causes of a similar nature have been found in other epidemics, this is exceptional if it were the cause.

A careful investigation of the outbreak in Waterbury revealed nothing that was commonly used as food or drink that could furnish a reasonable explanation. As in Providence it attacked people that were in comfortable circumstances, rather than the poorer population; for instance people living in their own houses, or renting a whole house for themselves. It is improperly called "Winter Cholera," but is a form of diarrhea occurring in winter, accompanied by watery evacuations so profuse as evidently to come from the blood and to produce severe cramps. It generally lasts three or four days. The temperature falls; in one instance two and a half degrees below normal, was reported. In very young children deaths have been attributed to this cause, but otherwise it does not appear to have been fatal directly, and scarcely ever indirectly. Whether it will appear regularly enough to gain an appropriate name, or is one of the strange and temporary manifestations of disease, remains to be seen.

DIPHTHERIA.

While scarlet fever was so prominent there were not so many cases of diphtheria reported. In the last six months, however, there has been an increase with epidemics in several places. The mortality and general prevalence has not, with exception of the epidemics, been unusually marked. There have, however, been striking instances showing the connection between filth and diphtheria that are as strong as mathematical demonstrations almost. The power of contagion is not denied as the proof is too plain, but the malignancy of the infection seems due to filth.

Where nearly all the members of a family that have before been as vigorous and healthy as any of their neighbors, die from diphtheria, and it is discovered after their death that they have been breathing the foul gases from the house drains, cess-pool, or sink drain, as has recently been the case not only in Connecticut, but in several other places that have been reported or discovered by an intelligent survey of the premises, it would seem that hereafter such provision would be made by every householder to prevent any such pollution of the air he and his family must breathe. There are but few that refuse to believe the evidence that is as plain as evidence can be, under the circumstances. We can never

expect *all* will be believers in sanitation. Some Rev. Jasper will always be found to say, "the sun, he do move." Not that the skeptics will be found among the clergy, for they are earnest sanitarians for the most part. Some of the most practical and useful papers have of late been written on questions in public hygiene by members of the clergy, and their influence is powerful in advancing the work.

There has been a tendency, if it can be so expressed, in diphtheria to attack all the children of a family in which it has appeared, perhaps nothing more than the epidemic tendency, shown so strongly. But in isolated families where there were from four to six children, and where the disease has been limited to one family by isolation and careful disinfection, in repeated instances all have had the disease. Probably in such cases the infection came from the first case, and was conveyed to the others before they were separated, or else they were all infected at the same time, and the period of incubation was of different length in the cases. Where the warm, moist, alkaline air of the drain pipe, cesspool, or vault, nourishes the germs to their fullest vigor, so that their life cycle is carried through with intensity, then they attack adults and children alike. Especially is this the case when, as occurs unfortunately too often, these foul places are ventilated into rooms occupied for various purposes, but worst of all as bed-rooms.

It seems that man is weakest against infection when he is asleep. The dread of night air may be partly due to this, although if malaria laden the dread is well founded. The belief in the connection between any unusual malignancy in diphtheria, scarlet fever and the like, and filth in the premises somewhere has become pretty general, so that a survey of the house and its surroundings is made at once. There is one radical gain yet to be made, that is, to have the survey made *before* the mischief is done, before the house is occupied, and to see that it is repeated at regular intervals, as well planned systems of house drainage, if carried out with precision, and the use of the best materials, require attention at intervals to see that everything is in order, as it is very often found that something has worn out, or broken, or that in putting in a new fixture old safeguards have been rendered worthless and new dangers introduced. Thus, in a case in New York it was found that after the deaths had occurred that a pipe had broken away, and when not discharging sewage under the

floor from one disconnected end, the other was conveying into the atmosphere of the house the products of sewage putrefaction, and the germs that live and multiply in these putrefactive products finding in them their most favorable conditions of growth.

In regard to the recent discussions as to the relations of sewer gases to the etiology of diphtheria, it appears the most rational solution that the sewer gases are carriers of disease germs, and more than that, furnish the essential conditions for their growth and reproduction. We can take the conclusions already quoted in relation to the germs of cholera as applicable to all for the warm, moist, alkaline air of sewers with its fetid and depressing gases nourishes all varieties of disease germs. So that, were the atmosphere of a dwelling, through some agency or other, polluted by the germs of diphtheria, it might happen that some of them would find favorable conditions for development, for it appears that these germs are dangerous only when going through the cycles of their life history. When matured they die, and it is those whose cycle of changes has been arrested, and preserved in this state, that are kindled into action by favorable conditions. But if the air of the house be polluted by sewer gases, the germs which were before dormant become active and malignant by the rapid multiplication that ensues. The putrefaction products are the food which nourishes the disease germs.

It must also be borne in mind that these gases are particularly depressing, they abstract oxygen from the air, and rob the tissues of the body if they hold oxygen in solution. They help to furnish the other element as well as to nourish the germs of disease. Thus, to produce infectious diseases, you must have the germ, the conditions favorable for its growth, and a receptive soil. The individual element is as essential as any, and without it no disease. There must, as we have before stated, be some such limiting condition, otherwise in the case just cited, all in the house would be seized. That there are conditions favorable for the multiplication of the microbe, outside the body, is shown in epidemics, as cases occur without direct exposure being traceable, or even in cases where the possibility of such exposure can be eliminated. It appears that in extreme cases the whole atmosphere may be in such a state as to furnish the essential conditions for the development and mu tiplication of the germs of disease. The receptivity of the individual is then the only limit to prevent the disease

becoming universal. The mutual interdependence of these causes explains many of the apparent mysteries in the etiology of the disease, and it is easy to see why contagion does not always occur. That is, we are partly enlightened, but, why the individual is or is not in a state of receptivity is not always clear. The case is clear for those that have been under unsanitary influences continuously, who are expected to succumb, and the hearty, vigorous inhabitants of healthy homes who are not expected to yield. Yet there is another set that are not explained except by the fact that they are or are not in a condition to receive the infection.

It is held by some, as was stated last year, that it is the question of individual receptivity that is the leading element in the distribution of epidemics; however this may be, it is of co-equal importance with the other two.

TYPHOID FEVER.

The return of typhoid fever is so recent that it still attracts attention, in proportion as did its decrease. Judging from the figures of 1882, and the reports of its prevalence during the year, it would appear that the mortality has been fully as great as in any preceding year. In the fortieth registration report of Massachusetts it was stated to be returning as rapidly as it had decreased, and over the same area. What was the cause of the movement on so large a scale does not yet appear. There are some laws that determine these cycles, that to know would be more than simply an addition to the number of things understood, so much is involved in the unknown laws. Local conditions can easily be relied upon to partly account for its prevalence, but to all seeming they remain the same until the general tendency is superadded. Nor does this always appear limited; thus there have apparently been favorable general influences predisposing to typhoid fever since 1879. We have read of epidemics in various cities, Paris, London, New York, Providence, in different times, meanwhile there has been the steady increase already mentioned in Massachusetts and Connecticut. Its return here has been somewhat variable as the table shows, where it is compared with malarial diseases. Thus, in Hartford last year there was more than the usual prevalence as there has been this autumn in New Haven. The epidemic in Waterbury may, perhaps, be accounted for by local causes, the upheaval of the soil in laying sewers, and the low state of the

reservoirs and wells. Thus, while there has not been any marked epidemic over the State, yet there has been an almost universal increase in the amount of sickness from typhoid fever, and in the mortality from that cause. There has been, from the existence of both typhoid and malarial fevers, side by side in places, an increase in the grand total, yet, generally, as the mortality from typhoid fever increases, that from malarial fevers decreases, so that the grand total remains about the same, and has not exceeded the deaths formerly caused by typhoid fever alone to any considerable extent. This is a very significant feature, especially when the idea that gained so strong a hold for awhile that intermittent fever drove out typhoid, and that the two could not exist in the same place at the same time has been proved fallacious, and we now find them side by side. There does however seem to be an antagonism between them; thus, when malarial diseases appeared everything took a malarial nature, and we had malarial diarrhea, malarial headache, malarial cystitis, a malarial or periodic type to every disorder, nor was this fanciful. Now the continued type prevails again or is steadily gaining the ascendency. There is a transitional variety termed

MALARIAL FEVER.

This is not easy to define, yet all that have had cases declare that it is essentially different from either typhoid or typho-malarial, or bilious-remittent fever. There is no decided chill, and the fever is low and long drawn out. There may be a distinct chill or two at the outset, but not necessarily, there is often unusual depression and chilly sensations at the time when a chill might naturally be expected, or an icy coldness along the spine. There is nausea and vomiting often at the outset, and a profuse bilious diarrhea that yields only after a free use of mercurials. Convalescence is tedious, relapses frequent, and in such cases a change of climate is often the only resort in order to regain any health or vigor. It is reported as unmistakable, if once treated, although not easily described so that one unfamiliar can separate it from other varieties. It shows the transition to the continued type, whatever its real nature may be.

TYPHO-MALARIAL FEVER

Has been in general much less frequent; as can readily be inferred, the decrease commenced in 1879 and has continued steadily since. In a few localities it has been as frequent as during any year.

There have been some peculiar features in one or two instances that will be discussed later. So far as can be traced, it seems to be influenced by very similar agencies to those which are favorable to typhoid fever.

MALARIA

Remains as much of a sphynx as ever. Its manifestations in New England have led to a general study of its etiology. Its asserted march across a large area of New England in a northeasterly direction, involving the whole territory in its line of march, irrespective of local conditions as regards hill or vale, lowland or upland, over regions where it had been unknown for fifty years or where it had never before been known, has presented complications that call in question former theories. Whatever the solution may be, it has resulted in a new impetus to the germ theory, which affords, to those that do not admit the possibility of a migration of the disease from its usual haunts, although in the history of the disease it has been stated to have thus extended over all Europe, a satisfactory explanation of all apparent inconsistencies in these manifestations. As stated two years ago, the germ theory affords a satisfactory explanation of the malarial invasion. The discussion belongs more appropriately to the more detailed account of its local progress or the reverse. It is enough to state in this connection that, as the question now stands, heat, moisture, vegetable decomposition, and a fourth, probably a biological factor, that is, some germ, or perhaps more than one species, are quite generally accepted as the agencies that produce malaria.

It should be said in this connection that there are some general changes which may render a certain portion of this State malarious unless measures on a large scale are taken to counteract them, if possible. The most important of these are the denudation of the hills, by the indiscriminate cutting of the forests, and which, perhaps, should be stated first, the cutting off the forests at the headwaters of the Connecticut. The river, as a natural consequence, has been growing gradually shallower. This, perhaps, may in part account for the manifestations of malaria in the valley of the Connecticut. There are local changes, like the construction of the Valley Railroad, that may have caused variations in local prevalence, as has been reported in relation to the grading of the New

York & New England, where malaria already existed; both of these were after the malarial invasion had become quite general.

Thus, while there has been a general decrease in the prevalence of malaria over the area first invaded and a very decided return to the continued type of disease, so that the malarial, or rather the periodic type, is no longer the governing one, nevertheless, it does not yet appear that malaria is about to leave us altogether. It rather seems as if, as stated, a considerable portion of the State were to become malarious, but not to any great degree. The reappearance of frank and clear cases of tertian ague, although not to such an extent as to imply an epidemic, has, for the present at least, forced the conclusion that malarial diseases must be added to our mortality list. That they will occupy a much less important place than they do now is as plainly indicated. It is dangerous to make any very positive statements, as the manifestations change so; thus, the appearance of acute tertian ague, when everything had been pointing to the entire fading out of malaria, was unexpected, as the masked and mixed varieties were the rule and typhoid more common than typho-malarial or even the so-called malarial fever. Each year, however, contributes new facts, and thus helps to clear up what was at first obscure.

EXPERIMENTAL METHOD IN HYGIENIC INVESTIGATIONS.

The necessity for a systematic experimental investigation of many of the questions in the etiology of disease has become imperative. Very much valuable and important work can be done in the instruction of the people in the laws of right living and in securing proper sanitary regulations. But to advance the cause of public hygiene and gain new powers over disease, careful, persistent investigations, with all the aids modern science can supply, are essential. It was hoped that this work would be undertaken by the National Government, or rather continued as began under the auspices of the National Board of Health, but that was rendered out of the question when the appropriation was refused, and there are little hopes of any immediate action from government aid. The etiology of malaria demands a careful study in order to learn, if possible, the primal cause and the conditions of its life history. All analogy points to the germ theory as the one to be investigated, at least, to see if it holds this secret, as it apparently does.

The carefully prepared and studious essay of Prof. Smythe should be carefully read, and some scheme devised by which action can be secured. As we may have malaria with us for some time, if not always, at least in some parts of the State, the problems concerning it become of greater importance to us.

The method of study proposed would be of benefit with regard to local conditions in relation to all diseases, and the facts accumulated would be of permanent value. It is earnestly to be hoped that work of this kind can be commenced soon, if in no other way, by joint action of several States. Eventually the movement to be inaugurated next May will, if successful, lead to some united action by State Boards of Health where now each acts singly. As far as we have been able we have provided for work in this general direction, and are now equipped with delicate balances and microscopic apparatus needful for the analysis of water, the examination of foods, milk and other liquids used as foods or drinks. The results of what has been done will be found in the detailed report. As work could not be undertaken, except the microscopical, until late in the year, not as much was accomplished as can be during the next year. This promises fair to be an important and valuable part of our work. But if some of the problems that are of practical as well as theoretical importance, like that of the etiology of malaria, or the pollution of streams, could be investigated, even if all the problems not completely solved, the facts collected in any such study would be of inestimable value in regard to other diseases, as each fact has a multitude of relative bearings beside the main question at issue, as many diseases are influenced by the level of the ground-water, altitude, dryness and moisture, and all the atmospheric and telluric data which the study invites. Each in its turn deserves a full and complete study. The atmospheric relations to disease have received fully as much attention as any of the three principal physical factors, but indirectly as an auxiliary study. The facts in meteorology and climatology have been accumulated with reference to the laws governing storms, and the probabilities of the weather, and similar studies. Still, the recorded facts have been utilized to show how the prevalence of disease is modified, if at all, by climatic and meteorological influences. In time we hope to commence systematic work in this direction. Thus far all our funds have been utilized in direct studies in certain departments, and in preparation for a full and thorough study of the

potable waters of the State, and the adulterations of food and drinks. The necessary apparatus for this is now either owned by the Board, or directly available, and work that has been done irregularly and partly supplemented by others, will in the future be done by us. Sanitary experiments on a small scale can also be regularly maintained. Some work of this nature will be found in the detailed report, but the means for this work, except under difficulties and outside aid for some of the manipulations, was received so late that but little comparatively was done. Amateur photography furnishes a ready means for obtaining an illustration of some unsanitary conditions more vivid than any word-painting can be, and during the coming year it is expected that much material will be thus gathered for our next report. The more difficult art of microphotography has been provided for, as the two are closely related. Should any tangible results follow, that can profitably be thus reproduced, the means are at hand. While it is not well to promise too much, this field has been but little worked, and there are ample supplies, if they can be prepared in time. The impurities in the air can thus be shown, and a series of studies of this kind are contemplated.

But the most pressing want is a study of telluric agencies, including topography, altitude, soil moisture, the ground-air, and the ground-water, the geological strata and formations, so that the local manifestions of disease can be more intelligently studied and understood. This requires the sole attention of an adept. Such work as was commenced by Prof. Pumpelly, under the auspices of the National Board of Health, is what is needed. If several States could unite, such work could be done, and in addition to the accumulation of many facts incidentally, that would be of lasting value, as in the studies above mentioned, when it was found that the germs of disease were not removed from water by its passage through the soil, many vexed questions in the etiology of disease might be satisfactorily solved.

Such work should be done under the supervision and direction of the State Boards of Health, and the means afforded by special appropriation. The subject is worthy of attention, and will ultimately receive the support it deserves. It is not expected that all desirable plans will be carried out at once, and time and study matures plans that may be at first crude, so that delay is not so unfortunate always as it at first appears.

There are two subjects that it seems cannot be delayed much longer. The first is the measure already mentioned relating to the

POLLUTION OF STREAMS.

It is to be hoped that the bill presented for action last year relating to a systematic study of the pollution of the streams in this State, with especial reference to what can be done with the waste of fertilizing material which is not only wasted, but becomes a curse to all that dwell near the course of these vile conduits, once the chief charm of the landscape, now sluggish ditches, exhaling mephitic odors, and disgusting the eye by the reeking filth that often forms a large proportion of the volume of the stream. Here and there a dam obstructs the flow, and a pond of a semi-fluid mass is formed, to reek in the sun; or, worse yet, when the filth is deposited in shallows and the pond is low, an area of putrefaction is formed varying with the size of the stream. Except at very high water the surface of these pools is studded with breaking bubbles, as the gases of putrefaction are given off into the air. Thus far experience has shown that filtration through the soil is the best method of purifying sewage polluted water, and it is surprising how small is the area required when the amount of filth is considered, but there must be several plats, so that one can be at rest all the while. Such a plat of ground properly prepared for downward filtration acts like a huge pair of lungs, as it has been stated, and oxidizes the impurities. If the aid of vegetation can be had the work is much more satisfactorily accomplished, as the filth is then completely destroyed. There are so many practical points, however, unsettled that a close study is absolutely necessary. How can sewage and manufacturing waste be kept out of our streams? What can be done in our climate by irrigation and sewage farming? What shall be done in winter? What can safely be allowed to enter the streams, and what must at all hazards be kept out? These, and a multitude of questions concerning the amount of pollution of streams, how much farther it can be carried without inducing a pestilence directly, and others that it would take too much space to mention, are indications of the need and value of the investigation proposed. It is provided that this shall be a practical work to solve questions that will lead directly to improved methods, and if the thing be in the bounds of the possible, to provide measures

that will yield a profit to those using them. Were the separate plan of sewerage in vogue the latter part of the problem would not be so difficult, as is shown at Pullman. Unfortunately that is not the case, but the indications are that the time is not far distant when all new work, at least, will be after that model. The experiment at Nahant will be watched with interest, where cleaning the small sewers through frequent manholes by use of mechanical means, with no system for flushing and no great abundance of water, is relied upon in place of the automatic flush tank. As experience has shown that in the separate system, the ball through the pipes, or some such measures, must be used more or less. If it be found that they can be used so that the flush tank can be omitted it will be perhaps a substantial gain. There are places where the water supply is scanty, and must always be so of necessity, where the success of this plan would permit the use of the separate system; moreover, the less machinery used the better, as in the case of traps and fixtures. That the constant flushing where there is a plentiful water-supply is desirable, in many respects, is also true. But to return to the subject directly under consideration. It is becoming a serious question, as city after city, especially our inland cities, discharges its filth into some hitherto pure stream, whether this can be allowed to proceed much further. That these cities must be sewered is no less evident.

The prevalence of typhoid fever and allied diseases, after a water-supply with no sewers has continued long enough to cause a sufficient degree of soil pollution, settles that question. What to do with the sewage and how to do, what is the best, are questions important enough, it would seem, to deserve a small outlay to settle satisfactorily. Of course, as is our duty, we are using all the means in our power to settle these questions; but the means for an experimental study must be obtained by a special provision. The combined method contemplated in the act is apparently as wise a methed as can be devised. There is truth in the criticism of the Sanitary Engineer that the work involved is large enough to employ a National Commission, and important enough to warrant its appointment, with a generous appropriation. This, however, does not make it any the less incumbent upon us to use all means in our power to avert the dangers that threaten us from this quarter. The second subject is one that has already received attention in the pages

of this report, but is none the less deserving of effort to secure, and that is the

TOPOGRAPHICAL SURVEY OF THE STATE.

Its importance has never been really denied, but the reasons for delay have been ingenious. The boundary of the State must first be settled, and the Capitol built. These objects have been accomplished, and the treasury is in a good condition. There are no benevolent institutions asking large appropriations; in fact, the present seems to be an unusually favorable time to commence operations. It need not be all done in one year, indeed could not, and all geological and special studies that could be combined would be of all the greater advantage. This is not needed for the sanitary interests of the State alone, but all classes would be benefited by this study of the material resources of the State. The manufacturing capabilities, now hidden, and the available watersheds, the need of commencing a system of forestry laws to protect our rivers and streams and the arable lands from drought, (a little national legislation on this point might not be objectionable), and a multitude of such questions, need the knowledge that a topographical survey would give. Few States have so little knowledge of their material resources, and of the area of the very towns themselves. The present method is certainly not very accurate nor scientific; a map is cut up into towns around the boundary lines and the pieces are weighed and the comparative weight is taken as a measure, some fairly well-known town furnishing a standard of comparison. It would appear argument enough almost for any intelligent man, to inform him that there never had been any exact topographical survey of the State; that apart from the work done by the United States Coast Survey, and the few localities that, like New Haven, have secured these benefits for themselves, there was no topographical survey of the State, and no exact knowledge of its varying local conditions of hill and plain, wet or dry, land or water, forest or arable land, that was available to any one that needed to know these facts for any purpose.

There is nothing except the incomplete geological studies, made some time since by Percival, and this is not generally accessible, being a rare book, long out of print. If any incidental scientific work could be incorporated in this survey, so much the better, but the topographical survey by all means should be made

without farther delay. The value of it to all local studies of disease, and to the study of the larger and more extensive movements of disease, is so plainly obvious that its mere statement is all that is required. That the results will be of permanent value goes without saying, as these relations change but slightly; man's alterations of the face of the earth are, after all, of the smallest consequence.

The work of the Board will be found for the most part detailed in these pages; at least such portions as are in a shape to report upon, or are of general interest. The rapidly increasing demand for our publications and the practical use made of the suggestions for the prevention of disease is a very gratifying and encouraging feature to us. The number of questions asked, and the practical points submitted, show that these articles are read and used. We have found that if the circulars on scarlet fever, diphtheria, small-pox, and all that treat of special diseases, are distributed at and adjacent to places where the disease of which they treat is more or less prevalent, they are read largely, and the demand is constant until all are supplied in the region near where the disease appeared. Wherever possible, such distribution is made. Over four thousand of these sanitary tracts have been sent out during the year, and we have every reason to believe that they have been read. That contagious diseases have been controlled by the means described in these publications we have every reason for believing. As small-pox became less and less prominent, the circular upon that subject was displaced by that upon scarlet fever, and as that disease increased in prominence, the circulation increased. For the time it has been published, this has been more widely circulated than any we have issued. These are kept in stock, and as new editions are called for, such changes and additions are made as experience suggests. There are yet quite a number of diseases that must be considered before our list in this department is complete.

Interesting accounts come to hand from time to time of the good results that have followed the perusal of these publications. The one on rural hygiene, has caused in repeated instances, to our knowledge, an entire change to be made in all the outbuildings, and the methods of disposal of filth. Better yet it has caused a survey of the sanitary condition of dwellings and their surroundings to be made before occupancy, leading to the discovery of

such unsanitary conditions as have devastated many homes, and caused a sacrifice of the lives of all the children of a family. These sanitary tracts are one of the best means we have of instructing the people in the principles of correct living. That lives have been saved by these instructions there seems no reason to doubt, and such a result is worth more than all the expense of maintaining the Board.

The position of sanitary advisers to the State involves no small degree of work as well as responsibility. Our relations to the people of the State in this regard have never been more satisfactory. In addition to the special investigations of disease, the more interesting of which will be given in detail farther on, we have been consulted by local health boards, school authorities, builders, heads of families, and individuals on almost every conceivable subject related to our work. Oftentimes their answer would require considerable research, when some obscure point was involved.

The systematic effort to inculcate a knowledge of sanitary principles and to so show their nature and practical importance that the people shall not only become convinced of their reality and truth but also be induced to carry them into practice epitomises a great share of our work. In this respect the annual reports must not be left out of the account. While there is less attention paid to details, these are not neglected wholly, but are used to illustrate the broad principles upon which public hygiene depends. To discuss questions that involve the interests of the whole State or of large sections, thus indicating the scope and wide province of State hygiene, and to show its relations to the multitudinous interests, and to the practical affairs of life, is here the principal object as distinguished from the more detailed work just mentioned.

It is no less our duty to keep an outlook for threatened perils to health and to guard against unreal dangers and unnecessary alarms. The latter is often as important a duty as the former, and has repeatedly been called into exercise. Exaggerated reports of the prevalence of disease have been corrected, and fancied dangers shown to have no foundation in fact. It is singular how easy it is to manufacture a panic, and to imagine all sorts of evil consequences from a small basis of fact, or indeed none at all.

The systematic study of the causes of disease is the second of the principal duties of this Board. In fact, almost all our duties can be brought under these two categories. This work includes

studies of special outbreaks of disease, investigations of towns, cities, institutions, dwellings and grounds, the educational systems, and the places where school-life is spent, the examinations of water, foods and drinks, and in brief the study of all the unsanitary influences that are in any part of the State brought to bear upon its citizens from the cradle to the grave. That its details are extensive and comprehensive appears from these condensed outlines. The monthly health bulletins should also be included in this summary. Their value and the good thus accomplished is shown more and more plainly as time passes. The repeated references made to them is another indication of the increasing attention they are receiving. The republication of such portions as are of general interest, by the medical and sanitary press of the country, is a pleasant indication that the truths taught receive general sanction. Indeed our publications have received the endorsement of the most eminent sanitarians of the land, and their commendations also. There is also another department of our work that is of no small consequence, and that is

THE REGISTRATION REPORT.

The yearly returns of the vital statistics of the State furnish an indication of its sanitary condition that could be arrived at in no other way. While it is true that for many purposes a registration of prevalent diseases and their prompt report would be of greater value, so far as the prevention of disease is concerned, yet there are many lessons that can only be learned from these returns. The more complete they are the greater their value; it would seem that public spirit and an interest in the proper execution of the laws would be sufficient to secure complete returns. Also that any persons that could substantially contribute to secure complete returns in any town would be more than willing to do so, but unfortunately such public spirit does not exist where we should most expect it. It is also a great improvement that we are enabled to supply all the physicians with copies of this report; since the number of reports printed was increased, physicians generally have been supplied. As these reports contain in a condensed form a partial sanitary history of each town, their value is evident to the intelligent physician who desires to learn the conditions, favorable or unfavorable, to longevity in his own locality, and also to compare it with other places. Thus data are constantly accumulating that are of value to those

that desire to learn the conditions favorable or unfavorable to health and longevity, as shown by the reports of a series of years. For purposes of comparative study these reports are constantly increasing in value.

It is needless to expatiate upon the value and importance of the record of vital statistics. Its connection with the sanitary work compensates to some extent the labor involved in the preparation of the tables as the study of the sanitary history each year involved in their preparation is of great value in many aspects of our work. The tables are as complete as the data available will warrant in most respects, but as the facts now recorded accumulate, other comparative tables will be rendered possible. It is of great advantage to keep the returns as uniform as possible and to make few changes in the plan, and yet present the lessons taught by these statistics in a clear light. The physician can now find all the most important facts tabulated, so that he can learn nearly all that is of practical value. The few deficiencies will be supplied as soon as the data accumulate for the purpose. The reports compare favorably with those of other States, and are classed by the reviewers among the best. It is hoped that the remaining defects in the completeness of the birth returns will soon be remedied, and then the returns will be equal to any. It would be an improvement were there a census every five years, as in some States, but there is no immediate prospect of this, as there are other more pressing needs.

THE CARE OF NEGLECTED AND DEPENDENT CHILDREN.

By a law passed at the last session of the Legislature it has become our duty to co-operate with the State Board of Charities in the care of neglected children. The provision of proper homes for their reception and finding permanent homes in families are the principal duties contemplated by this law. A Board has been organized in every county—as the law directs—and temporary homes provided, under the superintendence of competent persons. The Boards consist of the County Commissioners in each county and one member in each from the State Boards of Charities and of Health. Meetings have been held, and agents appointed in the different towns to look after this class of children and see that the provisions of the law are enforced; also, that these wards of the State receive proper care. The State Board of Health is

represented in Hartford county by Dr. J. S. Butler; New Haven county, Prof. W. H. Brewer; Fairfield county, Prof. C. A. Lindsley; New London county, Hon. A. C. Lippitt; Middlesex county, Dr. G. H. Wilson; Windham county, Hon. A. C. Lippitt; Litchfield and Tolland counties, Dr. C. W. Chamberlain. The law promises well, and apparently will accomplish great good. In some counties popular conventions have been held to instruct the people in the designs and purposes of the law, and much interest has thus been aroused. The work is one of the utmost value, as it prevents these otherwise uncaredfor waifs from growing up in ignorance and crime.

SCHOOL HYGIENE.

Some special studies have been made in this department of our work, and the results will be found later so far as they are ready for publication. This is one of the most important departments of sanitary work, and furnishes a constant opportunity for investigation. That our schools and educational system are among the best of this country is not denied, but it is none the less true that there are evils connected with the present methods that require correction. As parents surrender at discretion the training of their children during the formative period of life, without questioning the merits of the plans adopted, it is the duty of those that guide and control educational methods to see that the children receive a symmetrical, well-balanced training that shall result in securing the best results the material is capable of, and the ability to use to advantage the powers and faculties that have been trained. That the mind has been trained at the expense of bodily development is true, at least so far as educational methods are concerned, for they provide no means for physical training. Without arguing the points here, it is sufficient to state that such a course must, in some instances at least, result in intellectual ability at the expense of health.

The sanitary surroundings of school-life are too often defective. There is no time of life at which pure air is of greater utility than during that of growth and development. The paper of Dr. Lincoln, a well-known authority upon school hygiene, upon the requirements of our district schools, is one of permanent value, and furnishes a practical model of the sanitary provisions required to secure the best hygienic conditions during school life. This

will probably be issued separately and kept in stock for free distribution throughout the State. It is an encouraging feature in the development of public hygiene to witness the attention paid to sanitary principles in the construction of our school buildings. We have already illustrated this point in relation to the buildings for the high schools of Bridgeport and Hartford. The latter has the advantage of dispensing with stair-climbing, so deleterious to the health of the older scholars, as it is of two stories so far as the school-rooms are concerned. So good an example is worthy of extensive imitation, as an elegant, commodious building can be constructed to accommodate a large number of pupils at a reasonable expense, without resorting to the lofty buildings that have so long been devoted to this purpose. The school-houses of later construction approximate nearer the requirements of sanitary laws. In quite a number that have been inspected, the floor space, cubic feet of air space, and method of lighting were all that could be desired.

RURAL HYGIENE.

It is sometimes difficult to convince those that live among the naturally healthful surroundings of the country, that they need to pay any attention to the sanitary conditions of their homes. Yet, in these very places are often found the worst violations of the laws of health, with the unfailing results of disease and death. Decaying, organic waste and excrementitious filth are found wherever man exists, and carelessness in their disposal produces proportionately the same results wherever it occurs.

The paper of Dr. Gardner in regard to the unsanitary conditions of country life is the commencement of a series, or rather the continuation of one upon these and related topics. The agricultural convention already mentioned devoted a due share of its attention to topics of this nature, indicating the wide range that is open for consideration. The use of the rivers and smaller streams as sewers, practically also brings a new element into the discussion in many instances. There are some features that we anticipate will be in readiness for treatment in our next report in this department; meanwhile the article of Dr. Gardner will repay careful reading. The proper methods for the disposal of excrementitious waste, the construction of cess-pools so that no danger can result from their use, together with a clear presentation of the evils that result, both in city and country, from the present meth-

ods, furnishes material enough for one paper that could be also used as a sanitary tract for general use. Such an essay has been planned, and the investigation has been commenced. It is hoped that it may be ready for the present report. When published, it will be one of the most useful of our publications, as there is an increasing need of such a paper. There are different conditions that demand different methods of treatment, and for these proper provision must be made.

TENEMENT HOUSES.

The proper housing of the poor is one of the most important sanitary problems of the times. That much of the sickness among the poor results from unsanitary conditions over which they have no control, is beyond dispute. We have often seen an epidemic of some form of filth-disease start from such quarters, and spread in all directions, so that when shown on a map, the centers of infection stand out very plainly. This has repeatedly been seen in relation to diphtheria, and is shown to some extent in the Hartford epidemic.

The sanitation of the houses for workingmen no less deserves attention, as similar evils result from improper construction and neglect of sanitary laws. The paper of Mr. Gerhardt, a recognized authority, will fill a long felt want, and provides instruction upon points that have been under consideration for some time, as the evils resulting from negligence of sanitary laws and direct violations of the requisites for healthy homes became evident from repeated investigations and reports. The paper will be of permanent value, and particular attention is directed to the subjects there discussed.

SPECIAL REPORTS, AND UNSANITARY CONDITIONS.

The reports upon sanitary work done in the State, while valuable in themselves, serve also to show the attention paid to hygiene and to incite others to similar endeavors. It is our intention to present, as far as our means allow, accounts of the sanitary features of all public works done in the State. An account of all the town and city water supplies is in preparation, with tabulated statements, giving at a glance the most important details concerning them. The account of the methods used in the drainage and

sewerage of cities and villages, the sanitary features in the construction of public buildings, especially the ventilation, heating, and plumbing, all afford material that will be of permanent value in the sanitary history of the State.

The illustrations of the unsanitary conditions found in connection with disease and epidemics, deserve careful study, that the same results may not follow similar neglect. It is somewhat singular to witness the unwillingness of people to admit that anything can be wrong with their own houses, surroundings, towns, or cities. While the same evils they condemn in others may exist even to a greater degree in their own premises, it is very difficult to secure the admission, or to induce action, unless they are incited by the presence of disease in a very malignant form. Thus, there had been much sickness in a certain family, cases of diphtheria, typhoid fever, and a general depressed condition of all when they were not acutely sick. The head of the house was theoretically a good sanitarian, and had even ferreted out some obscure unsanitary conditions in the premises of others. The presence of a faint odor in the atmosphere of his house even did not induce action. But a near relative visiting the family during the sickness of one of the children, declared that there was something very wrong about the house. In vain was he shown soil-pipes ventilated through the roof, traps to each fixture, each ventilated separately. He demanded an investigation. At last, after failing to persuade the father to act himself, he received an ungracious permission to proceed. Tracing the odor to its strongest location he had the basement floor taken up and found the main soil-pipe, or drain-pipe that conveyed the whole waste of the house out to the sewer, broken off inside the wall of the house, and several cartloads of filth and filth-saturated earth were removed before a condition of cleanliness was restored. It is needless to state that the health of the family improved after this very materially. Such instances from real life, as this was, should be well considered, and if nothing of the kind has before been done, a sanitary survey of the premises should be made. This suggests the subject of

SANITARY ASSOCIATIONS.

The first one of these was formed at Newport, and is among other things a Mutual Sanitary Insurance Company. There is a fee for membership, which entitles each householder to

a sanitary survey of his premises once a year, if needed, and to the publications of the society. They also at their sessions discuss sanitary subjects, and constitute a village or city sanitary improvement society. Through the agency of such societies many reforms have been carried through, and some original investigations made. There is such a society in Stamford, in this State, and it is hoped that so good an example will not be lost. The village improvement societies could easily ingraft this work upon their plan, and, in fact, some have done this to a greater or less extent. A national association has been formed to favor this object, and their organ, called *Indoors and Outdoors*, gives much valuable information for such workers. It is published at a low price, but its contributors are among the best, especially of those interested in the movement to form rural improvement societies.

SANITARY LITERATURE.

The publications of the Board have received due mention; it is to be hoped that their perusal will pave the way for the sanitary journals, in some cases at least. There are now many excellent periodicals devoted exclusively to sanitary topics. Unfortunately their circulation is too much confined to professed sanitarians. The general public would find instructive as well as interesting matter in their pages. It would seem strange, were it not for the indifference with which the cause of public hygiene has had to contend, so fresh in the minds of all sanitary workers, that more professional men were not readers and subscribers to some of these journals; but their interest once awakened and attention gained, the indifference vanishes very quickly.

The library of the Board increases in value each year, and is used to some extent by physicians that desire to work up special subjects. Under certain restrictions, books are sent to responsible parties, for use in looking up some special topics. As time passes, this use is likely to become more extensive. The mere accumulation of exchanges would soon form a valuable collection.

THE CORONER LAW.

The new system has hardly had time to prove its utility. It already appears unfortunate that so many divergences were made from the plan urged by this Board. The retention of a coroner's jury in any shape was in direct violation of the plan as

advocated, and the multiplication of the number of the medical examiners a departure from the model given, but of less importance than the retention of the jury.

With some revisions the law apparently can be made doubly efficient. The loopholes for increasing expenses needlessly, perhaps, should be more carefully guarded, and any expenses that should not be allowed stricken out. It is capable of much greater efficiency than other methods, judging by the experience of others. Where no juries have been called the law has worked to the best advantage, but one method or the other should be adopted and all the evil inheritances of the old system pruned off.

LOCAL HEALTH BOARDS.

The number of towns that have availed themselves of the law allowing them to form smaller boards of health than the Selectmen and Justices of the Peace constitute, has been almost entirely limited to those that were incited to such action by the presence of small-pox, either within their bordors or near to them. This is unfortunate, because these smaller organizations, that by law may and should have a physician as one member, are much more efficient; moreover, when the fright is over such boards are too often allowed to lapse by default. Should the law compel each town to keep up a formal organization at least, some improvement would result.

As there is so much negligence in regard to the matter in most of the cities, it seems almost needful to have a law directing every city to furnish and require regular sessions of its Health Board, and records to be kept and a report to be made annually, together with a review of the vital statistics of the year. It is doubtful if, apart from New Haven, any of the Health Boards report regularly each year, or in many cases if they keep a record of proceedings. This is partly the fault of the various cities which make no provision for any such work. Nor do scarcely any of the cities except New Haven report upon the vital statistics of the year. The value of the sanitary work done in New Haven by its efficient Board of Health is shown by the comparatively low death rate, as well as in many other ways. Were their advice oftener heeded the sanitary condition of the city would be much better even than it now is. But sanitary evils are removed slowly, and as the result of long, persistent effort. Still, in spite

of all discouragements, much good and efficient work has been done by the health authorities of the different cities—some details will be given in the proper place. But with a more perfect organization better results could be secured.

In this reorganization the vital statistics should be placed under the charge of the city Health Boards. They, from the very nature of the case, could do better service, secure completer returns, and with less trouble than any others. The value of the systematic study they would of necessity be compelled to make of the local conditions favoring health and longevity, and the reverse, would be seen in their improved plans for the sanitary regulation of the cities. Probably the change will some day be brought about. The propriety of placing such matters under intelligent supervision is so obvious that the delay seems strange. In the country the advantages would not be so marked as in the villages and cities. In general, the Health Boards of the cities have done better work than in former years, but their efficiency would be increased by a better organization in most instances. The conditions vary so much that a general law is unadvisable, and in some respects perhaps could hardly be arranged, but each city could have its Health Board reorganized upon the same general plan, including by all means the charge of collecting the vital statistics. The latter would require some legislation to arrange.

Experience indicates that wherever there is an active health organization, the vital statistics are best collected under their charge. Physicians generally are indifferent unless they are also more than usually interested in sanitary matters, as is shown by their method of returning to the registrars, yet it is a duty physicians owe to society to make these returns, and while theoretically all acknowledge this, they are very lax in its performance. Even the clergy are not sufficiently interested in the relations of the marriage certificates to the morals of the community to induce them to obey the law as to their return within thirty days after the marriage is solemnized. The health authorities are, from the value of the returns to them in their work as well as their realization of the true importance of complete statistics, the proper parties to have this matter in charge. Could adequate provisions be made in all places, such a system should prevail all over the State. Where such a system has been adopted the results have been most

satisfactory. The difficulties in the way are for the most part technical and the change should be made gradually, not all over the State at once. There is one modification of the present law that seems desirable, and that is the extension of the burial permit law to all the larger towns; all that have over three thousand population, for instance. The plan has worked so well in the cities that its benefits should be extended.

THE BRIDGEPORT HOSPITAL.

By

GEO. F. LEWIS, A.M., M.D.

FRONT ELEVATION.

Bridgeport Hospital plans.

Lambert & Bunnell, Archts
Bridgeport, Conn.

THE BRIDGEPORT HOSPITAL.

By Geo. F. Lewis, A.M., M.D.

GENERAL REMARKS.

The Bridgeport Hospital was chartered in 1878. The State granted $50,000 in 1881, on condition that a site be furnished and an equal amount be raised. This was accomplished in 1882.

The Building Committee, one of its members being a well-known architect of this city, at once began the preparation of plans. The best hospitals in this part of the country had been visited, and the plans of the Seney Hospital, of Brooklyn, had been studied.

After mature deliberation there seemed but one course left op for the Committee. That was to adopt the "Model Ward," as repeatedly built in Baltimore by the Johns Hopkins Hospital, and again to be essentially repeated by the Seney Hospital. To build and connect two of these wards with a suitable main building was the problem as it presented itself.

The "Model Ward" referred to is complete in itself, and is the unit which multiplied to any number, and at any time, will furnish a great hospital system, without fear of contamination by overcrowding; the only important condition being that in the multiplication sufficient open space be left between the wards to ge the best effects of sunlight and air.

The main or administrative building is not a part of this system, but, of course, must be adapted in size and location to the number of wards it is designed to serve. Our aim has been to plan such an one as will answer for two wards now, with no need of alteration or expense in future when other wards are built. To accomplish this the interior of the second story and attic of the main building is left unfinished. The Committee have boldly arranged everything appertaining to administration under one roof,—including private rooms for those wishing the best accommodations.

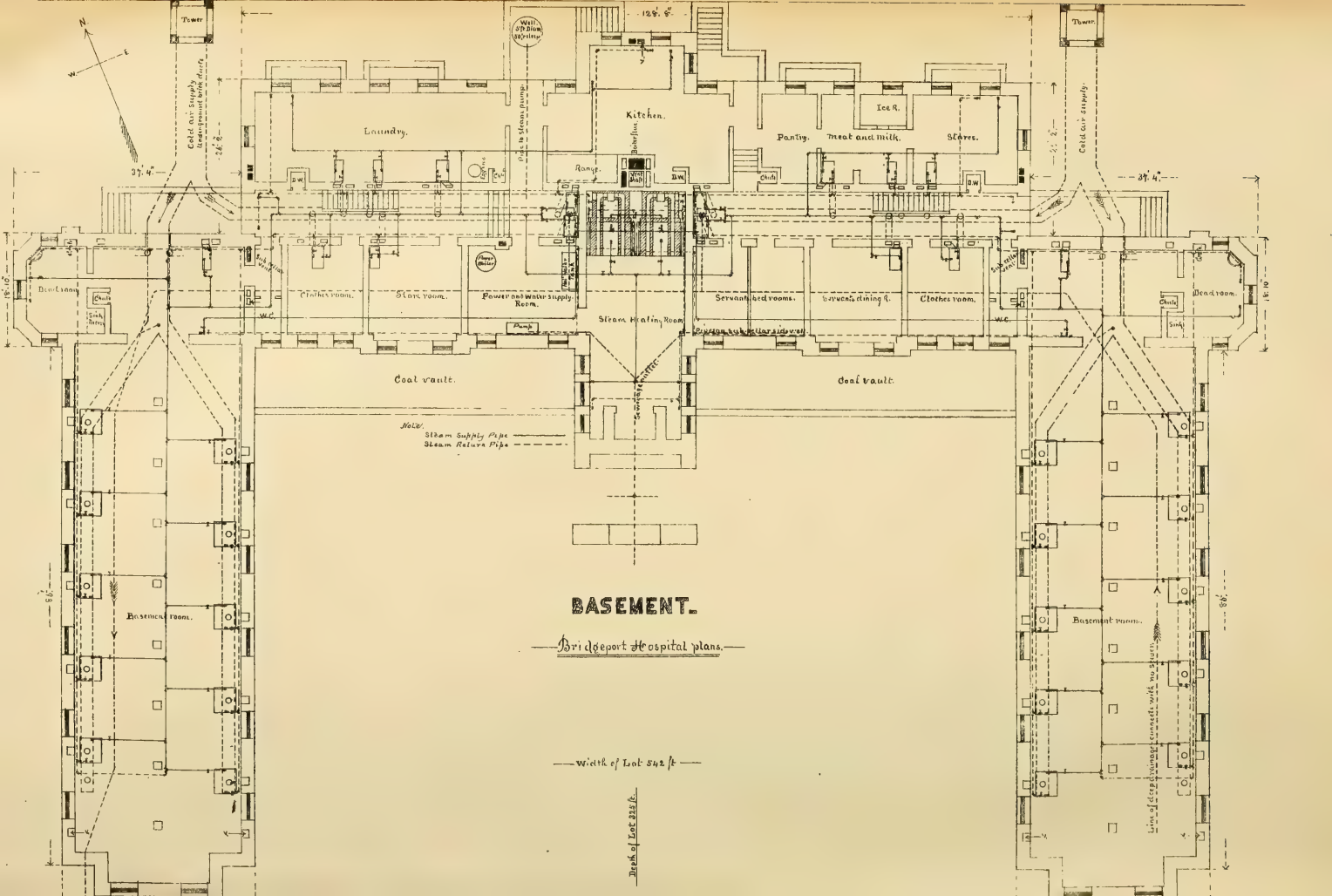
All these points will appear in the plates and the detailed description.

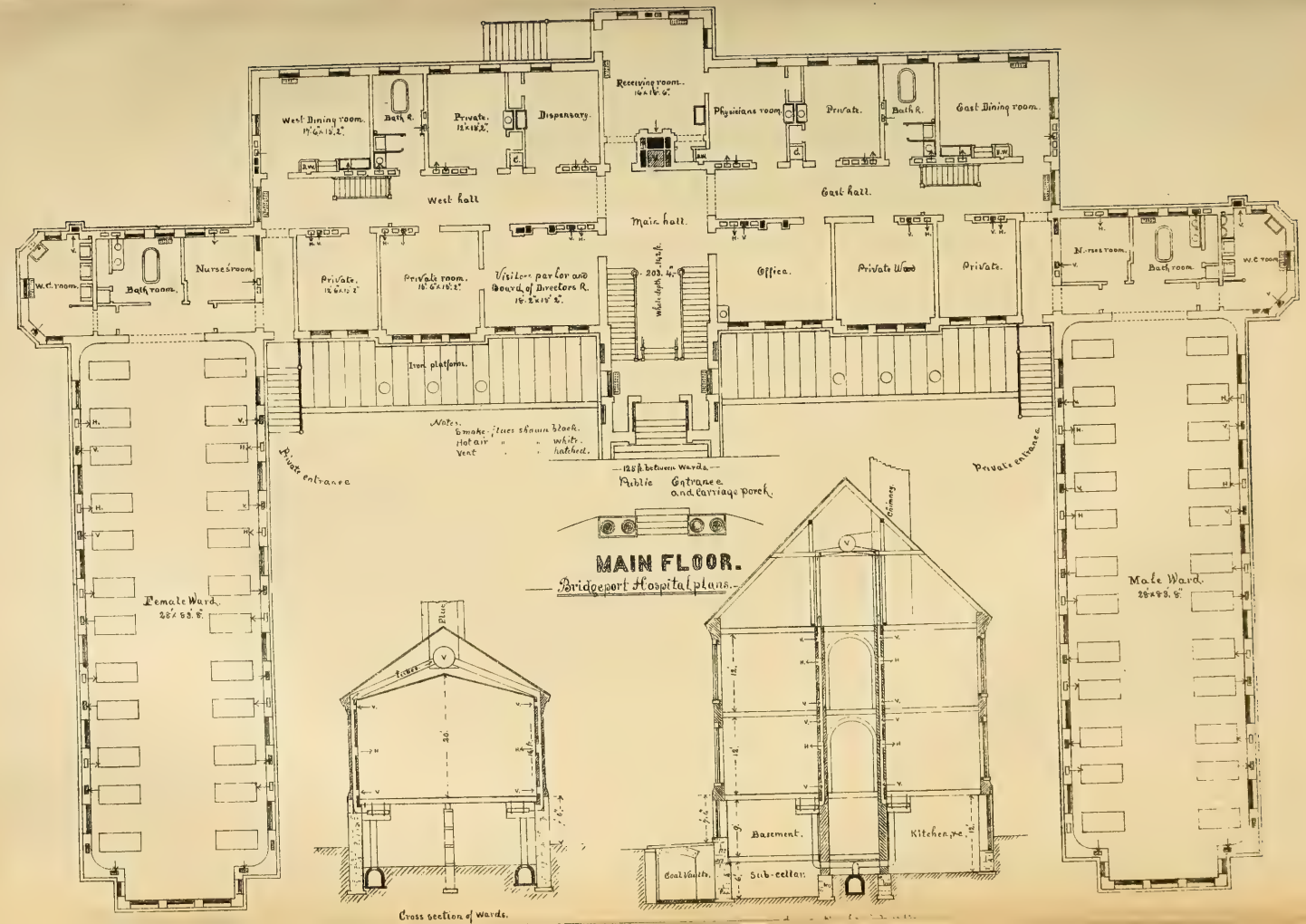
THE SITE.

The site, $1\frac{1}{2}$ miles from the Court-House, is elevated about 85 feet above mean high water, and commands a full view of the surrounding country and Long Island Sound. It naturally faces the South, has a frontage of 542 feet and depth of 329 feet, is nearly rectangular, and has streets on the South, East, and West sides. It gently slopes southerly and westerly. The soil is black and yellow loam to the depth of two feet; below this is a disintegrated gneissoid rock with a slight admixture of sand and clay lying in strata, and it holds water during the dryest seasons to an uncommon degree. This characteristic feature gives the advantage of an abundant supply of pure water from wells not over 25 feet deep to the houses situated on this elevation, while wells of equal depth distant only a few hundred feet and much nearer the level of tide water have remained dry during the past season. The disadvantage obtains of the necessity for deep drainage to secure a dry cellar. To this end a large stone drain has been built in the rear of the building, east and west from street to street. This takes all surface water naturally flowing toward the building and most of what soaks through to the depth of five feet or more. Should, however, any water appear in the cellar, open-jointed cement pipes are laid under the wards and main building below and near the side of the cold-air ducts and connected at several points with them. The stone drain and the cement pipes are not connected with, nor do they run near any sewer, but open at the lowest point of the site in the gutter. Nothing but pure water gets into them, and this only in wet seasons.

LOCATION AND DESCRIPTION OF THE BUILDING.

The general plan of the building is in the shape of the block form of the letter **E**. The body of the letter represents the Administrative Building, and the limbs the two wards, while the cross shows the carriage porch and main entrance. Fronting the south,—the wards of one story, the main building of two and an attic, and the whole resting on a high basement,—the structure presents no difficulties in utilizing to the fullest extent the effects of direct sunlight and of the natural circulation of air. Located


Tower
Well 8 ft Diam 18 ft deep
128' 8"
Kitchen.
Laundry.
Pantry.
Meat and milk.
Stores.
Ice R.
Range.
Boiler flue
Pipe to Steam pump
Cold air Supply Underground brick ducts
Cold air supply
37' 4"
Dead room.
Clothes room.
Store room.
Power and Water Supply Room.
Steam Heating Room
Servants bed rooms.
Servants dining R.
Clothes room.
Coal vault.
Coal vault.
Basement rooms.
Basement room.
Note.
Steam Supply Pipe
Steam Return Pipe
BASEMENT.
Bridgeport Hospital plans.
Width of Lot 542 ft
Depth of Lot 225 ft.


West Dining room.
Bath R.
Private.
Dispensary.
Receiving room.
Physicians room.
Private.
Bath R.
East Dining room.
West hall
East hall.
Main hall.
Nurse's room.
W.C. room.
Bath room.
Private.
Private room.
Visitors parlor and Board of Directors R.
Office.
Private Ward
Private.
Nurse's room.
Bath room.
W.C room.
Iron platform.
Note.
Smoke-flues shown black.
Hot air " white.
Vent " hatched.
Private entrance
Public Entrance and Carriage porch.
Private entrance
Female Ward.
26 x 53. 6.
Male Ward.
26 x 53. 6.
MAIN FLOOR.
Bridgeport Hospital plans.
Flues
Chimney
Basement.
Kitchen.
Coal Vaults.
Sub-cellar.
Cross section of wards.

in the center of the lot there remains ample room east and west for the erection of additional wards when needed, which can be connected by corridors with the main building, in which will be found ample room for all the service needed, except perhaps for laundry work and heating apparatus, which will then be more convenient y placed in a detached building in the rear.

The wards have been described as similar to those built by the Johns Hopkins Hospital, and by the Seney Hospital. They are each, including the bay windows, 88 feet long, 28 feet wide, 16 feet high at the sides, and 20 feet high at the center, and contain about 44,650 cubic feet of space, which accords 102 feet of floor space and 1,860 cubic feet of air to each of the 24 beds. Sunlight can flood each bed at some part of the day. By reference to the plan of the main floor, it will be seen that the wards do not attach to the main building except by the annexed room in the rear, and are therefore practically isolated or detached. This design is adapted to the climate of this latitude and economizes the administration. The distance between the wards is 125 feet, which is the length of the central building.

The appearance of the whole structure is imposing, being solidly built of stone and brick. The roofs are steep, and slated, with terra cotta cresting. A ventilating stack rises at the rear of each ward, and one in the center of the main building behind the tower. In front are large coal-vaults on each side of the carriage porch. They are covered by iron platforms 11 feet wide and 52 feet long and are designed also for sunny promenades in winter. The basement story is of quarried blue stone. In the wards this story is to be vacant, or used only for the steam pipes and galvanized iron boxes containing the radiators. Sufficient space, however, remains in the bay-window ends of the ward basements for two rooms, which may be finished for violent patients. The basement story of the main building comprises, in front, a clothes-room for each ward, two sleeping-rooms and a dining-room for the cooks, a store-room, a boiler-room, and an auxiliary boiler-room. The rear basement rooms are a large laundry and wash-room, kitchen, meat, milk, ice, and store-rooms.

The dead-rooms are in the basement of the wards in the actagonal projection.

The main floor of the administrative building has six rooms in front and seven in the rear, as shown on plan. As will be

noticed the ward dining-rooms are located in the rear corners of the main building as near the wards as possible. This secures economy of service from the kitchen and does away with the double tier of rooms usually annexed to hospital wards. Thus ventilation lengthwise through the wards is attained when the season will permit the opening of the windows, and this is very important here where the prevailing winds during the Summer are from the south.

No plan of the second story is shown. Its interior will now be left unfinished until additional wards are built or more room is needed for private patients. It will contain thirteen rooms—and also bath-rooms, etc. In this story over the rooms annexed to the wards are two five-bed wards—with windows on three sides. These are now left unfinished.

WATER SUPPLY.

The water for the institution is obtained from a well 45 feet deep and 6 feet in diameter, located as shown in the rear of the main building. A Worthington steam pump forces the water into large wrought-iron tanks in the attic. From the quantity of water used daily in the construction of the building during the past summer, which has been a season of drought, the severest for a generation, it is reasonably certain that there will be no lack of a constant supply for all purposes needed.

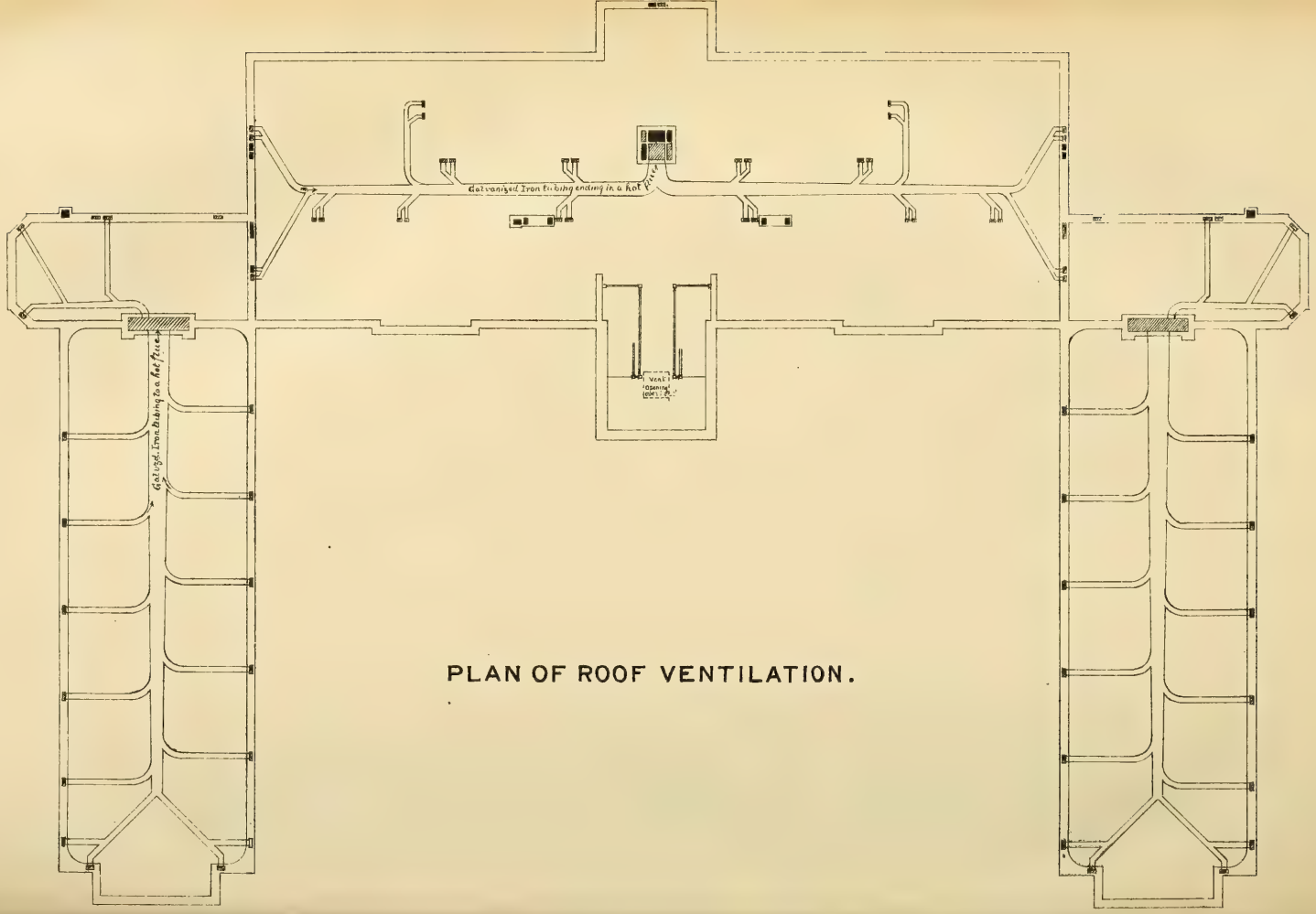
LIGHTING.

The buildings have gas-pipes throughout, and a Tirrill's 200 Light Equalizing Machine will supply the gas.

INSIDE FINISH.

The side walls of the wards, halls, basement rooms in the main building, closets, bath-rooms, operating-room, ward dining-rooms, and nurse's-rooms will be finished smoothly in brick work and treated with English silicate paint. This finish avoids the use of furring and lath, thus saving space and rendering the building safer from fire; also it is cleanly, cheerful, will not crack nor fall like plastered walls and is impervious to moisture. Walls thus finished can be easily repainted, washed, and scrubbed.

The ceilings of all rooms and halls with painted brick walls are to be finished with ceiling strips of yellow pine with bevelled edges.



PLAN OF ROOF VENTILATION.

To prevent dust and air from getting through between these strips a heavy wide felt paper is first well lapped and nailed to the ceiling-joists. The principal rooms in the main building will be finished with a mixture of lime and Portland cement laid on like ordinary plaster. The floors are Georgia pine, $2\frac{1}{2}$ inches wide, selected, with no butts to show in any rooms except in the wards where they obviously must show. There is nothing peculiar about the rest of the interior work, and it is, therefore, not described.

PLUMBING AND SEWAGE.

The plan of the sewage system is such as to leave all pipes inside the building in sight where they can be easily inspected. Extra-heavy cast-iron pipes with leaded joints are run east and west through openings in all division walls, where they are supported about two feet above the cellar bottom. These unite in the boiler-room and pass out under the carriage porch as shown on the basement plan. The ward water-closets are in rooms with octagonal ends, having windows on three sides, thus securing the best natural ventilation in mild weather, in addition to the flue-ventilation.

In the main building there will be no water supply in or out in any of the front rooms, except the office. The rear rooms are all supplied as indicated on the plan of the main floor.

Mott's enameled French bath-tubs, Demarest's patent earthenware closets with waste-preventing cistern, and Bowers' rubber-ball traps or "The Metallic Bar" traps, have been selected. All the traps will be ventilated by $1\frac{1}{2}$ inch iron pipes connecting and terminating in the attic in the large soil-pipes running out through the roof.

WARMING AND VENTILATION.

Obviously a ward, occupied day and night by the sick, requires a system of warming and ventilation which shall work out results very different from that required in a school, a church, or a public hall. A modern hospital accords about 100 square feet of floor space, and 1800 cubic feet of air to each patient; a school about 20 feet of space, and 260 feet of air to each pupil; a church much less than a school, and a hall, with the gas-jets consuming the oxygen, a minimum. Every one has felt the chilliness of a hall or church on first entering, and suffered almost unbearably from the

heated air and closeness, before an hour has passed. In such cases it is plain that the only remedy is a rapid and voluminous inflow and outflow of air from numerous openings. To a less extent the same remedy should be applied to the ventilation of a school. It follows that the currents of air forced through a ward need not be so rapid, nor so large in volume, as in other public rooms, where people are compactly seated, and where the air supplied to each individual is reduced to a minimum.

The heating and ventilation, as adopted, has been carefully laid out by Mr. A. Mercer of the "H. B. Smith Co." Steam heating by the indirect method is introduced in the wards, and all the rooms throughout the hospital, except in the halls, the operating-room, the ward bath-rooms, and the ward water closet rooms.

These, being used only at intervals, are better heated by radiators. The ward dining-rooms have both systems, radiators being needed for keeping food and drink warm. The ward water-closet rooms have a flue in connection with which a grate-fire can be used when the weather will not permit any natural ventilation.

Two safety low-pressure sectional boilers are located in the basement of the main building, which are provided with all the approved automatic attachments to regulate the steam pressure and water supply to the boilers; and the apparatus is so constructed as to work perfectly noiseless, and return all the water of condensation from the radiator to the boilers by gravity.

In addition to the heating boilers there is a high pressure boiler placed in the engine-room for the purpose of supplying steam for the engine and pump, and ventilating coils in the ward-stacks, and also for heating water for baths, laundry purposes, and for steam-cooking. A hot-water boiler is also placed in the engine-room, so connected as to take the exhaust steam from the engine and pump.

By referring to the basement plan, it will be seen that the fresh air supply is taken in from two low towers, one to the northeast and the other to the northwest of the buildings. The air passes down into underground brick ducts, which, dividing, run, one to the main building, and one to the wards, and this, soon subdividing, runs to each side of the wards.

In the wards, the air is taken out of these ducts at the top through galvanized-iron pipes, and passes directly into galvanized-iron boxes, in which the radiators are placed, and thence up

the flues in the walls, entering the wards seven feet above the floor, directly opposite a foul-air flue on the other side of the room.

The same plan is carried out in the main building, except that the warm air enters the rooms on the inside walls, and the foul air is drawn out on the same side, near the floor, or ceiling, as desired. By means of a lever in connection with each warm-air inlet, the inflowing air can be made to pass around, instead of through the radiators, to any extent, as desired.

The foul-air flues are tin pipes built in the walls. In the wards they start [see main-floor plan] from the floor, where a register is set, and run to the ceilings, where another register is set, thence, above the ceilings in the attics, they run to the large central ducts leading to the stacks, as shown on the plan of roof ventilation. All the pipes and ducts in the attics are made of galvanized iron. A similar plan will be in use in the main building, except that the pipes are built in the inside walls. To aspirate the wards artificially steam coils are laid in the stacks, but in the main building ventilation will be carried on through a shaft heated by the close proximity of the smoke-flues from the kitchen and boiler rooms, but coils can be used here if needed.

A departure has been taken from the plan of drawing out the foul air as adopted in the Johns Hopkins and Seney Hospitals, not, however, because it is not effective, but because it is expensive at the start in the construction and expensive all along to keep it working in a satisfactory manner. Their system, theoretically, should work best in the coldest winter weather, when least needed, because the suction pipes, running beneath the wards in the basement to the stack, are not chilled by the surrounding air to such a degree as would be the case when the pipes are placed in outside walls and in the attic. In summer, however, suction by their plan must be carried on by heated coils or gas-jets, whereas flues in side walls and pipes in the attic become heated and aspiration goes on naturally while the sun shines, and, indeed, so long as the attic space remains warmer than the inflowing air. In mild, foggy, damp weather, when the outside air moves sluggishly, both systems should work well by forcing aspiration, and neither should work at all satisfactorily without it. Since the greatest need of forced ventilation is felt in this condition of the atmosphere, the plan adopted will prove economical and effective.

There is abundant evidence that, with all the natural advantages of a high elevation, open country, high basements, one-story pavilions, and the great distance between them, there will be no lack of pure air supplied by this system, which has been found to work so well in other hospitals, where the natural advantages are less favorable.

Were it not for the expense of construction and administration, the laundry and kitchen, store-rooms, boiler-rooms, and dead-rooms could have been placed in a detached building. As arranged no patients are to occupy beds directly over any of these rooms. In the future, if six or more wards are needed, in place of two now built, many or all of the rooms above specified will be needed for other purposes, and a detached building will then be a necessity.

The aim has been to provide a hospital substantial, cheerful, economical in the first cost, and also in the administration, capable of being enlarged on a pre-arranged plan at small expense, and yet all else subsidiary to the one great end, the speedy recovery of the sick.

HYGIENIC INSTITUTES.

THE UTILITY OF THEIR WORK OF INVESTIGATION, AND THE NEED OF IT IN THIS COUNTRY.

By Prof. GEO. A. SMYTH, Ph.D.

DR. C. W. CHAMBERLAIN,

Secretary of the Connecticut State Board of Health,
Hartford, Conn.

My Dear Sir:

It is with great pleasure that I comply with the request contained in your letter of October the 18th, to furnish a paper for your Annual Report, advocating the establishment of hygienic laboratories in this country. I do this with the greater readiness because I fully share your conviction that an earnest and persistent effort should be made to direct the attention of the general public to the importance of the prosecution of scientific hygienic investigations.

In the following article I have endeavored to sketch in a very brief manner the development of hygiene as a science, and to discuss a few of the researches which seem to me to illustrate the principal objects of its pursuit, and to show in an especial manner the necessity of its further prosecution. Not having access at present to scientific public libraries, I have not been able, in preparing this article, to re-examine several of the papers to which I have referred, which are scattered throughout various medical and other scientific journals, etc., but have been obliged to rely upon the recollection of earlier reading, or upon information received at second-hand: a circumstance which I would plead in extenuation of any minor errors, which may possibly have been made.

In advocating the establishment of Institutes of Hygiene, I have gladly availed myself of the opportunity of urging, incidentally, the claims of our Medical Schools for a more generous public support. If this article should be of any avail whatever in arousing the attention of the public to the importance of the development of the science of hygiene, or in furthering the interests of our medical institutions, I should be more than amply repaid for the labor of its preparation.

I remain,

Yours very respectfully,

GEO. A. SMYTH, Ph.D.

BURLINGTON, Vt., Dec. 24, 1883.

HYGIENIC INSTITUTES.

THE UTILITY OF THEIR WORK OF INVESTIGATION, AND THE NEED OF IT IN THIS COUNTRY.

Hygiene, as an experimental science, is of very recent origin. Though many of the present general principles of hygiene have come down to us from remote antiquity; though we find in many of the earlier medical and historical writings of Greek and Latin authors frequent observations on the effects of topographical conditions and of the character of the soil, water, and air upon the health of a people, and more particularly on the influence of these factors in the origination and propagation of pestilential diseases; though in the middle ages the study of hygienic problems was renewed, and has ever since engaged the attention of many earnest students, especially in the ranks of the medical profession, nevertheless the work of *hygienic experimental investigation* is essentially of modern origin, and is the product of the present century. Nor was an earlier development of scientific hygienic research possible. Not until pure chemistry and physics had enlarged our knowledge of the materials and forces of nature, and furnished the means of exact experimental investigation, could hygiene, which derives its methods of research so largely from these branches of pure science, become the subject of experiment and be established on a scientific basis. The development of physiology and pathology also necessarily preceded it, for from them it derives, too, in part its means of investigation. It is not surprising, therefore, to find not only that hygienic research is the work of the present century, but also that its development has been mainly within the last few decades. Isolated investigations of problems lying within the domain of hygiene may, indeed, have been made earlier, but the systematic pursuit of hygienic researches, and the establishment of large, well-endowed and fully equipped institutes or laboratories for the experimental investigation of the influences of our surroundings upon health, are of very recent origin. Mod-

ern hygienic research received its greatest impulse, if it may not indeed be said to date, from the controversies which arose over the causes of the epidemic prevalence of certain infectious diseases, particularly the cholera, and the means of their propagation. It is, furthermore, the experimental study of the etiology of infectious diseases which has given to hygiene its leading direction, and has secured for it recognition, and the means of support.

It is our desire in this article to call attention to the present condition of the science of hygiene, to its aims and its claims for support, for the purpose of urging the importance of the prosecution in our own country of these studies which are now being so earnestly pursued in other lands.

During the prevalence of the cholera epidemic in 1848 in England, the theory was advanced by Snow, Budd, and others, that the infective matters of that disease were taken up by the water of the soil, and that the drinking water was, consequently, the principal means of its communication; and again, in 1856, similar attempts were made by Budd to trace the source of typhoid fever infection to the drinking water. Enlisting general attention, these views found at once both zealous advocates and equally earnest opponents, and a bitter controversy arose over the origin and the means of propagation of these and other infectious diseases, which has raged uninterruptedly ever since, and is still far from a full and final settlement in all of its particulars, though it has been conclusively demonstrated that water is but the bearer, and perhaps not the most frequent at that, of the specific contagion, which has its origin elsewhere. Among the many who entered the lists to combat these views, is Pettenkofer, who has been the most determined and, as the history of the controversy has proved, the most successful opponent of this, so-called, drinking-water theory of infection in its most radical form. Not content with the effort to prove argumentatively that this theory lacked substantial foundation, that in many, if not all the cases of supposed infection through drinking water other factors were involved, in consequence of which the infection could not be traced directly to the water, Pettenkofer endeavored to ascertain by a careful study of all the conditions, and by experiment, what those factors were which combined to spread the infection; and his researches, continued over a period of thirty years or more, have led him to the unalterable conviction that the causes of the epidemic prevalence of certain infectious

diseases, as cholera, abd ominal typhus, etc., are to be found *in the soil*, and that it is only through the thorough, systematic investigation of all the physical, chemical, and biological conditions of the soil that their etiology can be finally brought to light. These researches have laid the foundation of hygienic investigation, and have won for Pettenkofer deservedly the title of "the creator of experimental hygiene."

In his early investigations on the etiology of the cholera, Pettenkofer was led to direct his attention prominently to the experimental study of two, as it has proved, very potent factors in the development of certain forms of epidemic disease, to the study, namely, of the *humidity and the atmosphere of the soil*. Suspecting that the varying conditions of the soil as regards the amount of moisture which it contained influenced materially the local and temporal distribution of cholera and other epidemic diseases, he began in Munich the investigation of the movements of the *subsoil or ground-water*, determining periodically its fluctuations, and comparing them with the mortality statistics of various diseases. A comparison by Buhl, in 1865, of the data thus obtained during a long time with the mortality statistics of typhoid fever in Munich, showed, in a most surprising and unmistakable manner, that a very intimate relation existed between the movements of the ground-water and the fluctuations of this disease; the sinking of the ground-water being followed by an increase, the rising by a corresponding diminution in the death-rate from it. The statistical comparison extended over too long a period of time, and the correspondence of the data was too invariable to admit of an explanation on the ground of mere coincidence, or to leave any room for doubt that, in that city at least, an actual causal relation existed between the fluctuations of the ground-water and the prevalence of abdominal typhus. Believing again that the decomposition of the organic matter of the soil might have an important bearing on the etiology of these epidemic diseases, and that the determination of the gaseous products of the decompositions would furnish the readiest clue to the relations, if any existed, between the organic impurities of the soil with their changes and the epidemic prevalence of disease, Pettenkofer entered upon a protracted investigation of the gases within the soil, directing his attention especially to the determination of the carbonic acid. The first results of these investigations, laid before the Bavarian Academy at Munich in 1870, and

published in 1871, showed that our atmosphere does not terminate at the surface of the earth, but, extending below the ground, forms there what is called the soil or ground-air, and that this ground-air takes part in the decomposition of the organic matters of the soil, and consequently becomes richer in carbonic acid and poorer in oxygen than the outer atmosphere. The researches also suggested the question, whether the ground-air was not the main source of the carbonic acid of our atmosphere, and determined its fluctuations. The hygienic importance of the ground-air became at once apparent, and its significance as a health-factor became still more evident when it was found that the carbonic acid did not escape from the soil by simple diffusion, but that between the outer and the ground-atmosphere there was a very free inter-circulation, which was governed by the fluctuations of temperature and of barometric pressure of the air, by the velocity and direction of the winds and by the rain-fall, etc.

These investigations excited immediately the liveliest interest in medical and other scientific circles in Europe. They demonstrated the great value of the line of research adopted by Pettenkofer. They aroused attention in the most forcible manner to the fact that the external surroundings exercised a vast, though unknown, influence upon the health of an individual and the community. They established the conviction that chemical processes and other unseen activities were at work in the upper soil-strata of the earth, which were a mighty factor in the production of disease, affecting not only the water we drink, but also the air we breathe; and they awakened at the same time the hope that through comprehensive experimental investigation, in many different localities, of all the soil conditions, light might be thrown upon the origin of epidemic disease. They stimulated investigation to an unwonted degree, and created an interest in the study of hygienic problems, the fruits of which we are just beginning to realize.

About the time of the publication of these researches by Pettenkofer, Delbrück, in some communications respecting the cholera epidemic of 1867 in Halle, discussed the relations of the temperature of the superficial soil-strata to the development of cholera, and expressed the opinion that the time most favorable for the spread of an epidemic was when the soil had its highest temperature combined with a certain amount of moisture. The study of these questions was quickly taken up by others, and, following the

initiative set by Pettenkofer, hygienic investigators in several different European countries engaged in researches upon the chemical and physical conditions of the soil and their relations to disease. Observations of the soil-temperatures at various depths; determinations of the vertical fluctuations and the flow of the ground-water, and of the humidity of the upper soil-strata; analyses of the soils and drinking waters, especially the determination of the organic matters contained in them; estimations of the nature of the organic soil-pollution, whether of vegetable or animal origin, and of the character of its decomposition (oxidation or putrefaction); determinations of the carbonic acid of the ground-air and its fluctuations, and of the movements of the ground-air; these and other experiments were made here and there, either as isolated investigations or in a more or less connected series. The study of the biological activities of the soil have also engaged earnest attention since Fodor, Schlösing, and Müntz and others advanced respectively the views that the decomposition of the organic matter, with the consequent production of carbonic acid, and that nitrification was not due to chemical agencies, but to the life-processes of microscopic vegetable organisms.

It would far exceed the proper limits of the present article to discuss in detail the researches on these various subjects which, during the preceding decade, have been carried on in several hygienic institutes, or even to mention the part borne by the individual investigators in the gradual development of hygienic laws; and we must confine ourselves to a brief discussion of the results of a very few investigations in their relations to the etiology of certain diseases of an epidemic or endemic nature, and to a general statement of the condition of hygienic science at the present day and the object of its researches.

Next to Pettenkofer, who, in addition to numerous other investigations of a hygienic nature, has steadily pursued the study of the etiology of infectious diseases, and has revolutionized the theories in regard to the origin and mode of propagation of cholera, Fodor, perhaps, has contributed most largely to our knowledge of the relations of the soil, etc., to epidemics and to health, and to the determination of suitable means and methods for hygienic investigation. In a systematic series of investigations on the relations of the air, soil, and water to epidemic diseases, carried on for a series of years in Budapesth, under authority of the Hungarian

Academy of Sciences, he has shown in a very clear and suggestive manner the dependence in that locality of certain forms of epidemics upon the soil conditions and activities, and has demonstrated afresh the great epidemiological value of the kinds of research enumerated above. From the comparisons, namely, of the data obtained through his determinations of the fluctuations and flow of the ground-water, the temperatures of the soil at various depths, the local contamination of the soil with organic filth, and the mode of decomposition of these polluting matters, with the morbidity and mortality statistics of the various infectious and contagious diseases in Budapesth, he has shown that several diseases of the so-called miasmatic and miasmatic-contagious types, as *malaria, enteritis, typhus,* and cholera*, are, in that locality at least, largely under the controlling influence of the soil, are dependent both in their local and temporal distribution on its varying conditions, and are governed more especially by the amount, distribution, and manner of decomposition of its contaminating organic matters. They are thus all in a sense *filth diseases.*

The influences of the soil upon these various maladies are not, however, identical. The manifestations of a causal connection between certain processes in the soil and the development of a disease varied with the character of the latter. Typhus, for example, was found to be unaffected by the temperature of the upper soil-strata, or by the production of carbonic acid, which, as Fodor shows, can be regarded under certain restrictions as the measure of the putrefactive decomposition of the superficial soil-strata, but was governed very closely in the frequency and intensity of its attacks by the fluctuations of the ground-water. Typhus, therefore, Fodor concludes, is influenced by the changes which take place in the lower soil-strata, in which the ground-water fluctuates.

On the other hand, between the prevalence of malaria and the fluctuations of the ground-water, Fodor could trace no connection, nor could any be found between its prevalence and the humidity of the lower soil-strata or the putrefactive processes of the soil. It was, however, found to be dependent upon the temperature of the air and the humidity of the upper soil-strata. A rise in temperature for a few days was invariably followed by an increase in

*By this term Fodor designates the abdominal form of the disease or the typhoid fever of English writers.

the number of malarial attacks, the maxima occurring during the hottest periods; while an increase of soil moisture from the fall of rain, etc., was generally followed by a diminution in its prevalence. Malaria increased, therefore, with the temperature and the dryness of the upper soil-strata, and Fodor concludes with reason that its miasm is the product of the superficial strata of the soil, and affords in this respect a striking contrast to typhus. His further conclusion, that the infectious material of malaria is a micro-organism, which is developed beneath the surface of the soil and is brought, possibly, by the ground-air to the surface and given off into the outer air, is open to serious objection. Granting for the moment that the infectious material is an organism whose breeding-ground is in the soil, it is very improbable that it can pass out of the soil and be taken up into the circulation of the air in the manner indicated, for the soils, even in thin layers, retain these micro-organisms and their germs very tenaciously under air aspirations.

But more striking still are the results of the comparison which Fodor instituted between his soil experiments and the mortality statistics of *enteritis*,* that disease which in its summer ravages yearly sweeps away so many thousands of lives, especially of children. The fluctuations of this disease in Budapesth went hand in hand, during the four years of his observations, with the process of decomposition of the organic matter in the soil, and left no room for doubt that its epidemic outbreak was controlled by the putrefactive decompositions taking place in the upper soil-strata. This view is in entire harmony with the character of the disease and the theory of its origin, viz.: that of a putrid infection. The paramount necessity of a thorough experimental study of the soil in all its relations to health can hardly be shown in a stronger light than by the discovery that the summer diarrhœal complaints are probably diseases which have their source in the soil, that they are caused by an unknown something which is given off from the soil in consequence of certain putrefactive decompositions in its upper layers, and which is taken up into the system, from the air by the organs of respiration, and from food and drink by the organs of digestion. Similar comparisons,

*The term enteritis is apparently used here in a generic sense to denote the various diarrhœal affections and not specifically inflammation of the intestines. Intestinal catarrh is the form most frequently designated by him under this term.

showing an influence of the movements of the ground-water and the decomposition processes of the superficial soil-strata upon the epidemic spread of cholera, were made by Fodor, but it would lead us too far were we to pursue this subject further in detail.

Not only upon the temporal fluctuations of all these epidemic diseases, but also upon their local distribution, was an unmistakable influence of the soil made manifest by these researches of Fodor's. From the results of a house-to-house examination it was found that wherever the soil was most heavily laden with organic filth, and the decompositions assumed more largely a putrefactive character, as shown by chemical analysis of the soil and the ground or well waters, there cholera, typhus, malaria, enteritis, etc., prevailed most extensively. Wherever, on the other hand, the soil was freer from polluted matters and the decompositions were more largely through oxidation, there the mortality returns from infectious diseases of "miasmatic or miasmatic-contagious" types were generally far lower. No connections between the contagious diseases, measles, scarlet fever, croup, and diphtheria, and the contaminations of the soil could be traced by Fodor.

In judging the results of researches of the nature described above it must be borne in mind that they have as yet been tried only in a few places and have been continued during comparatively short periods of time. The value of the work already done lies more, it may be said, in the promise of future discoveries than in the present realization of definite results. The results obtained in different places do not agree in every particular; nor, indeed, could such an agreement be expected, as the conditions under which the experiments are tried vary very materially in different localities. Such experiments, with all the additional aids that time and experience may suggest, need to be carried on, therefore, for a long time and in a large number of places of unlike physical and geological character. The work already accomplished seems, however, as Fodor has stated, to point very clearly to one general conclusion, namely, *that it is the filth of the soil and its decompositions which lie at the foundation of certain forms of epidemic disease.* From the decomposing filth of the soil, the water and the air probably receive the morbific matters which they convey to the human system. It is the decomposing organic

matter of the soil to which, according to present indications, we must look in the ultimate analysis as the cause of the origin and development of infectious disease, and to which the other factors alluded to above must be referred. Changes in the temperature or the humidity of the soils or the air, the height, the vertical fluctuations, the flow, or the stagnation of ground-water, could not of themselves, it may fairly be inferred, produce the conditions favorable to the origination and spread of an epidemic. They are secondary factors which exert their influence whenever and wherever the essential prerequisite exists, viz.: the presence in the soil of decomposable organic matters in sufficient quantities.

In proportion as the evidence in favor of a vast epidemiological significance of the soil increases under the advance of hygienic investigation the more immediate and pressing becomes the necessity of ascertaining the character of this influence and the way in which it is exerted. What is the nature of the emanations from the soil which at certain times in particular localities tend to produce an epidemic outbreak of some special form of disease, or, if not themselves directly to produce it, at least to aid in its generation? In what way do these emanations, acting both through the water and the air, exert their influence upon the human organism? Though much is being learned, as we have seen, in regard to the conditions which favor their action, we are still left almost wholly to conjecture as to what they are and how they act. So far as our present knowledge extends, however, it seems probable in the highest degree that the influence of the soil, air, and water upon the so-called miasmatic-contagious diseases, typhus, cholera, yellow fever, etc., is not direct, *i. e.*, that these media do not of themselves produce the diseases or the specific contagious elements. On the other hand, the influence of the soil in producing the purely miasmatic diseases, under which head, besides malaria, the various enteric complaints must probably be classified, is apparently more direct, though this has by no means been conclusively proven. But if the influence of these emanations from the soil be indirect, do they act, as is commonly supposed, upon the human system in such a way as to lower its tone, to render it more susceptible to infection from a disease and less able to withstand its attack; in other words, do they produce the *individual disposition?* or do they act, as Pettenkofer is more inclined to believe, upon some matter given off from diseased persons which thereby

acquires its specific contagious powers? Again, considering the nature of the emanations from filthy soils, which are thus directly or indirectly instrumental in generating various epidemic diseases, do they consist, as Naegeli, and following him Fodor also, endeavors to prove, of a certain class of microscopic vegetable organisms, "*miasmata-fungi*," which, propagating and developing in the human body, so alter the chemical condition of some one of its liquids as to prepare it for the attacks of the specifically pathogenic organisms, the "*contagia-fungi*"? or are they rather, as Wernich and others suppose, unorganized matters, *putrefactive gases*, which, acting upon the system, lower its vitality and debilitate it to such a degree that it is no longer capable of successfully resisting the invasions of micro-parasites which are present in the body? These are questions to which at present no definite answers can be given. The whole matter is shrouded in mystery; to unravel which a vast amount of patient, unremitting, and systematic investigation will be necessary. We must first study more thoroughly and comprehensively the chemical activities of the soils. We must determine more accurately the chemical nature of the gaseous and other products of decomposition of the organic filth in polluted soils, and ascertain their pathological significance, if such they have. Again, we have to study in all their details the biological activities of the soils. We must ascertain the origin, character, and mode of development of those low forms of vegetable life which are produced or contained in the soil; determining the changes, both morphological and physiological, which they are capable of undergoing, and the influences which the soils exert upon them. Following out the natural history of these organisms in the soil we must then investigate whether any, and, if so, what soil-organisms are capable when taken up into the system of producing disease or of paving the way for the action of other distinctively pathogenic organisms. In short, we must study the whole life history of micro-vegetable organisms both in the soil and the human body. We must trace out, furthermore, the characteristic differences, both chemical and biological, between the pure and the filth-polluted soils.

In discussing the work of hygienic researches we have dwelt in the foregoing pages more particularly upon the results of certain chemical and physical investigations, which have seemingly established the fact that the soil is capable of exerting a wide-

reaching and important influence upon the health of individuals and of communities. But we have reason to suppose that the decomposition of the organic matters of the soil, especially those of a putrefactive nature, upon which this influence depends, may be in a large measure due to the life processes of certain low orders of vegetable organisms, and furthermore, so far as we can at present see, the soils furnish but one factor in the genesis of many if not all the epidemic diseases herein discussed, in that they produce an unknown something which either acts upon the individual, predisposing him to the invasion of the specific contagion of a given disease, or acts upon certain matters given off from diseased individuals to produce the specific contagion itself. Whatever the origin of these specific contagious principles may be; whether they are the product in some obscure way of the soil and the individual jointly, or of the diseased individual solely, or, again, are of utterly unknown origin, there are many reasons for believing that they are organized elements. The vast hygienic importance of the thorough study of the natural history of microorganisms, of their relations to health and of the part which they bear in the etiology of disease, becomes at once apparent and cannot be too strongly emphasized. It remains, therefore, to say a few words in regard to the work which is being done in this field of hygienic research.

Through the investigations of microscopic botany and of physiology the existence has been brought to light, as is well known, of an almost innumerable number of varieties, species it may be, of minute organisms, which are mostly of a vegetable nature and which derive their sustenance from various kinds of animal or vegetable organic matter. Multiplying with immense rapidity wherever the conditions are favorable for their development, in one form or another these organisms or their spores are almost universally present. They are distributed through the soil in the flow of the rain or the ground-waters; are taken up in the dry state by the air, owing to their almost infinitesimal lightness, and swept hither and thither as an invisible dust. Now borne onward in a current of air or water, now settling on all exposed objects, they remain in a quiescent state or renew a developmental activity, according to the nature of their surroundings. Through the activities of these various classes of organisms the decomposition of organic matter is in the main effected. The souring of liquids,

as milk, beer, etc., and all other forms of fermentation; the rotting or decaying of fruits and vegetables, and the putrefying of animal matters, are invariably caused by the growth in them of some form or forms of minute organisms, and are an inseparable accompaniment of the process of growth of these living organisms. To the active development of these vegetable fungi a certain amount of warmth and moisture is essential. Though frequently able to survive exposure to intense heat or cold or the application of powerful chemical agents, their multiplication and development can be retarded or entirely checked for a time by the employment of one or the other of these agencies. The preservation of foods by canning, by salting, pickling, smoking, or other chemical process, by desiccation or refrigeration, is due either to the exclusion from them of all such organisms and their germs, or to the prevention of their growth and self-multiplication.

Not only do many of these low vegetable forms subsist upon dead organic matters, the various products of higher vegetable and animal life, but they are also able under favorable conditions to attack the living organisms themselves, to conflict with the normal activities of their cells, appropriating and decomposing their plastic materials and, as true parasites, developing on or within the plants and animals at the expense of their cells. From the discovery of these facts one of the greatest advances of modern surgery, the introduction of Lister's antiseptic method of operating, and of dressing surgical wounds, has resulted. The performance of surgical operations under a spray of carbolic acid or other antiseptic, the use of sterilized instruments, the application of carbolized cotton and bandages, etc., preclude in a measure the noxious organisms floating in the air from contact with the wounded surfaces, and prevent such organisms as have gained admission from active development and the resulting septic infection of the blood. The beneficial effects of this method in severe operations, especially in crowded hospitals in which the air is often swarming with pathogenic organisms, has been very marked, the comparative freedom from subsequent blood-poisoning permitting a much larger percentage of successful results than was attainable before its introduction.

The discovery of these numerous low organisms, and of their power under certain conditions of developing within the human

system, could not fail to lead to the inquiry whether a deep pathological significance was not to be attributed to them. Might not the presence and the growth of these organisms in the body be intimately associated with the genesis of disease? Might not the immediate cause of all zymotic diseases be the rapid multiplication and development in the system of some low organism whose life processes are antagonistic to those of the individual? The morbific and contagious principle of a disease would thus be an active, living organism, and the disease itself would be at once the result and the sign of the conflict between the normal processes of cell life of the individual and the self-multiplying or growth-power of this foreign organism. Accordingly as the one or the other ultimately prevails in this struggle for existence the disease terminates in recovery or in death.

Recent pathological researches have indeed shown that all highly infectious or contagious diseases, and some others, as pulmonary consumption, the contagious character of which is not so distinctly marked, are accompanied by the presence in the blood or affected organs of certain microscopic plant-growths, and have led to the almost universal acceptance of the theory of the germ origin of zymotic diseases. They have, furthermore, firmly established the conviction in the minds of many that for every infectious disease there is a specific organism which is peculiar to it and which produces it. The existence of a characteristic organism, which will produce a given disease, and which is invariably present in that disease and in that alone, has, however, been as yet but very rarely conclusively proved. Most clearly has such a genetic relation between a given disease and a particular organism been traced in Koch's remarkable researches on the origin of splenic fever, which have fully proved that this malignant malady is caused by a well-defined, peculiar vegetable growth.* In many forms of disease the supposed discovery at one time or another of the presence of a specific organism has been disproved, or at least has not been confirmed by subsequent investigations,† while in

*The *bacillus anthrasis*, which was first discovered by Davaine in the blood of sheep and cattle that had died of anthrax. A microbe, which is the apparent cause of swine-plague, has been isolated and studied by Klein, and another, which produces chicken cholera, has also been detected and cultivated by Toussaint. Koch's remarkable discovery of the *bacillus tuberculosis*, and seeming demonstration that this microbe is the cause of tubercular consumption, should also be mentioned here.

†The existence especially of a specific organism that produces malaria has been repeatedly denied, and also reaffirmed by different investigators, since the alleged discovery of a *bacillus malariae* by Klebs and Tommasi Crudelli.

others their presence has only been suspected. Generally the organisms found in the blood or affected organs are such as are common to many diseases, or are frequently found elsewhere, and possess no peculiar pathogenic character. They are not, then, peculiar to a given disease, nor has it been proved that they can give rise to it, or that they are more than accidentally present during its attack. It has not been shown that they are more than mere accompaniments of the disease which owes its origin to some other cause. It may be that the disease produces conditions which are favorable to their development, while under the normal conditions of the bodily functions they are destroyed or rendered inactive by the chemical activities of the body.

Though the germ theory of disease in its general form is well-nigh universally accepted, this view that there is a specific organism for each and every form of infectious disease is by no means shared by all. As Naegeli has shown, there are many reasons for supposing that the innumerable varieties of micro-organisms do not form natural-history species, which reproduce themselves with unfailing regularity, cause the same decompositions, and, in case of pathogenic action, give rise invariably to the same symptoms. These organisms seem to possess to a remarkable degree the power of adaptation, the capability of changing by regular gradations not only their morphological but more especially their physiological character, according to the nature of the nutritive materials which are afforded them and the physical conditions with which they are surrounded. By repeated cultivations in appropriate media innoxious varieties of organisms may in time become indued with the most virulent properties, while conversely organisms exercising distinctive and intense pathogenic powers may ultimately be brought to reproduce harmless forms. The possibility of this, at least, has been amply demonstrated by Buchner's experiments. The pathogenic organisms may, in accordance with this, be modified forms of other more common varieties and not distinct species. It remains, therefore, for future investigation to determine whether each germ disease is caused by a distinct, unvarying species of organism or by some common variety which is in a particular stage of development and indued with unusually active, peculiar powers.

Not only may a micro-organism, which occasions a given disease in a human being or some lower animal, be rendered entirely

innocuous through successive cultivations in different media, but it may also, by culture in some other animal or in appropriate media, be so "attenuated" or changed in character as to produce the disease, indeed, but in a milder or perhaps essentially modified form, and through the introduction of this less deleterious form of the disease to protect the system for a time against its attacks of a severer character. The efficacy of vaccination is, undoubtedly, due to this. The brilliant researches of Pasteur on chicken-cholera and the anthrax of sheep show that this principle is capable of a much wider application, and inspire the hope that the thorough experimental investigation of pathogenic organisms will lead in time to the determination of means of inoculation whereby human beings and the useful lower animals may be protected from the ravages of all deadly contagious diseases. Already the claim has been raised of similar results in some very recent investigations of yellow fever, but of the results of these and of some other recent investigations on scarlet fever it is, as yet, too early to judge.

Such are the directions of some of the most important researches of modern hygiene. Their object, it will be seen, is the thorough investigation of all the etiological factors of epidemic disease. They comprehend the investigation in many different ways of the principal sub-strata of life, *the soil, air, and water*, with reference to their pathological effects. Gradually this work, originating in a few private researches, is obtaining public recognition and support abroad. Already several of the European governments, Germany especially, awakened to a sense of the grave importance of a more thorough study of all zymotic diseases, and convinced, through the distinguished labors of Pettenkofer and other pioneers, of the utility of hygienic investigations, are beginning to establish large institutes or laboratories for the promotion of the science of hygiene in all its branches, and are enlisting in the cause of hygienic research the services of many men of eminent and varied scientific attainments. Amply provided with all needful apparatus, liberally endowed with means for investigations, and, above all, furnished with a corps of able and skilled investigators, may it not reasonably be hoped that these hygienic laboratories will in the future be of very material service in ferreting out the causes of various diseases and in discovering proper measures for their mitigation and ultimate total extinction, and hence become of lasting benefit to humanity?

What, meanwhile, is being done in our own country to advance this important work of investigation into the causes of the origination and spread of epidemics? So far as any organized, systematic, and sustained efforts are concerned, it must be answered—NOTHING. The few isolated researches which are carried on here and there are the work of private individuals, unsupported by the national or state governments, and unaided, if not unrecognized, by the public. The National Board of Health, it is true, during the few years of its active existence, endeavored to encourage hygienic investigation by supporting in different places special researches on some of the epidemic diseases and on questions of general sanitary importance; and the hope was entertained for a time by some that these labors of the Board would ultimately lead to the establishment of a permanent hygienic institute, with an organized corps of special investigators, in which the subject of epidemic disease and other important problems of experimental hygiene could be investigated in a more comprehensive and systematic manner than is possible by detached researches in separate laboratories. But these hopes were doomed to disappointment, and the Board of Health itself, after a brief period of activity, was practically abolished through the refusal of Congress to make any adequate appropriation for its maintenance. Nor is the necessity of scientific hygienic research recognized and appreciated by the general public. Excepting by the members of the medical profession, if indeed by them very generally, the true character of this work is as yet but little understood. Public interest in matters pertaining to general sanitation has been aroused, indeed, and is yearly becoming more and more widespread, as is evidenced by the establishment of numerous local Sanitary Protective Associations; but the objects of these societies are generally of a somewhat superficial character and their labors are almost exclusively confined to the discussion of practical sanitary regulations. The investigations carried on by them are of trivial importance. The need of developing the science of hygiene is nowhere recognized as it should be.

If sporadic cases of typhoid fever occur in any locality we attribute them at once to the use of impure drinking-water, and if, on a single, hasty chemical examination, a certain amount of organic matter is found in the water, the disease is "*traced*" to its origin in some well or spring, which has clearly become contaminated

from some neighboring cess-pool or other source of pollution. But we remain in ignorance of the other influences which may be at work around us, and unmindful of the fact that the disease could not have originated in the well or the cesspool; that the water, therefore, could have been at the most but a carrier of the infection. The single chemical analysis of the drinking-water, of little value at the best, is often positively pernicious in its effects, inasmuch as it diverts the attention from a thorough study of all the possible factors in the production of the disease, and frequently gives rise to a feeling of false alarm or equally false security. If diphtheria, scarlet fever, etc., appear in a household the house drainage is immediately held in suspicion, and these maladies are "traced" again to defective plumbing and the dreaded sewer-gas. But we attach no importance to the fact that other agencies are at work here over which the ignorant or wicked plumber has no control; we are heedless of the possibility that the vitiated air of a surrounding filth-polluted soil may be entering the dwelling through cellar or basement and circulating through all its rooms, and are unconscious that this soil-air, though entering unseen and betraying itself by no sickening odor, may often be far more baneful in its effects than sewer gas itself. And so on through the list of infectious and contagious diseases. Again, if an endemic outbreak of disease occurs, attention is immediately directed to the necessity of extra sanitary precautions, such as the removing of all filth from cellars or back-yards, the clearing out and disinfecting of all cesspools, privy-vaults, drains, etc. All this is well enough so far as it goes, but it alone will never prevent the outbreak or further spread of epidemic disease, still less will it throw any light upon its causes and means of propagation. We frequently content ourselves during the prevalence of an infectious disease with simply putting all noisome matters out of sight by covering them over or burying them in the earth. But such is our ignorance of the nature of diseases and of the influences of the soil upon their propagation that we cannot be sure that in loading the soil with filthy, and especially with infected, matters we are not putting them where they will have the best possible opportunities to do harm. Once more, if a disease breaks out in a most violently epidemic form, threatening not only single localities but also entire communities, the governments, state or national, are stimulated to activity, and besides the tremendous exertions to

stamp out the existing epidemic a feeble effort is also made to investigate it. A commission is perhaps appointed to inquire into the cause of the outbreak and—*report.* But in time the epidemic is checked or dies out, and the work of investigation into its etiology is no longer supported and is discontinued until some new sudden emergency calls forth a renewal of these spasmodic exertions.

Haste and a lack of thoroughness are the chief characteristics of all these efforts to grapple with the problems of epidemic disease, and nowhere are these unfortunate American peculiarities more disastrous in their consequences than here. By no such efforts can these immensely difficult problems ever be solved. The etiology of an infectious disease cannot be investigated by researches which are carried on only during the prevalence of an epidemic of that disease. Possibly the time for investigating some of its factors is already past, and a more prolonged study of all of them is necessary. It cannot be worked out through the unsupported, isolated investigations of single individuals, who are obliged to devote the main portion of their time to the practice of their profession or to other pursuits. It cannot, finally, be worked out by the labors of a single class of investigators alone. We are accustomed to leave the study of the causes as well as of the treatment of disease entirely to the medical profession. But the practicing physician alone cannot search out the etiology of a "miasmatic" or "miasmatic-contagious" disease. He has neither the time to conduct the necessary experiments nor the requisite training to investigate some of the essential factors. Nor can the biologist or the chemist alone determine all the separate factors. Only by the patient, long-continued and united labors of workers in all these departments can the operative external influences with their separate and combined effects be thoroughly traced out. And the work must be done, in great part at least, in our own country: we cannot rely wholly upon the labors and discoveries of foreign investigators, but must study in many different places our peculiar local conditions with reference to endemic and epidemic diseases. For many of these diseases statistical observation is the only method of investigation which seems to give promise of successful results. This method requires, it is evident, years of unbroken, persevering study of all the possible influences of our entire external surroundings, as the soil, the air, and water. To

carry on this work of experimental study the necessary facilities must be created. Hygienic laboratories must be established and a permanent force of special investigators employed to conduct the various physical, chemical, biological, and pathological experiments.

It must be acknowledged that the task before us is one of exceeding difficulty. We are fighting an unseen foe. The influences at work to produce epidemic disease are many and complicated; our means of tracing them are frequently inadequate. In spite of all our facilities and the labors of many workers it may be years before the etiology of a single epidemic disease will be thoroughly worked out; it is not impossible that some forms of disease will forever baffle our efforts. But shall the earnest attempt to investigate these diseases not be made, because the way is beset with difficulties and the successful issue of the conflict not assured at the outset? Surely the prevalence of epidemic diseases in our midst is a subject of sufficient importance to demand our most serious attention, if there exists even a remote possibility of our being able to investigate their causes. Enteritis in its different forms produces with each recurring summer a frightful amount of infant mortality. Scarlet fever, diphtheria, membranous croup, etc., sweep away annually thousands of lives, among the young. Typhoid fever claims many victims, appearing here as a sporadic disease, there again as a severe endemic. Malaria ruins hundreds of lives, and in some parts of the country is on the increase and is gradually extending its domain, appearing year by year in places it has never visited before. Small-pox and especially yellow fever break forth at intervals in the form of frightful epidemics, and within a very short time cause a terrible destruction of life and occasion the loss of millions of dollars' worth of property. In the face of these facts shall we as a nation do nothing to support the efforts of those who are endeavoring to investigate the causes of such diseases, and thus to lay the foundations for comprehensive prophylactic measures? The expenditure of vast sums of money and years of laborious toil would certainly be none too great a sacrifice if these efforts should be crowned with even partial success. Do not the methods of investigation of epidemic diseases discussed above and now being tried in other lands seem to hold out a sufficient promise of success to warrant their further extension, and their introduction into this country also? If they do,

then beyond a question they should be immediately and liberally supported.

We have discussed in this article the work of hygienic laboratories solely with reference to the investigation of the etiology of certain infectious diseases. But though this is the work of hygienic investigation which is of the most immediate and urgent importance, the researches of scientific hygiene are by no means limited to this one subject. The soil, air, and water exert, undoubtedly, a profound influence upon the general health apart from their important relations to any specific form of infectious disease, and it is a further work of experimental hygiene to search out this influence. A more thorough experimental study of means and methods of disinfection is also imperatively necessary. The most comprehensive and effective methods of disinfecting cannot, it is true, be determined with advantage until the nature of infection itself is more thoroughly understood; but nevertheless, as we are often obliged to adopt practical measures to prevent the further spread of a disease, notwithstanding our ignorance of the nature of its infective matters, it is of very great importance for us to determine experimentally the relative efficacy of these various measures in destroying the contagia, or in counteracting their influence. There are, moreover, many other special subjects of hygienic investigation. There is, to enumerate a few of these, the study of foods and clothing in their relations to health-subjects which require an immense amount of chemical and microscopical investigation. Again, there are the many and complex influences of our dwellings upon our health to be investigated. We have here to determine the effects of building materials of various kinds upon the natural ventilation, the temperature and the humidity of the houses, and the influences which our methods of heating and lighting and our systems of house-drainage exert in contaminating the air of the rooms; and finally we need to investigate experimentally the subject of ventilation, with reference to determining the limits to the natural ventilation and the amount of artificial ventilation which is consequently necessary in private and in public buildings. The influences of various occupations, so far as they can be made the subject of experiment, are also objects of hygienic investigation.

In brief, it is the province of the science of hygiene to investigate the influences of all our surroundings which are more or less

continually active and, hence, not of an accidental nature, and which produce effects upon health of a serious and lasting character. Hence, its work is of a very multifarious character. Its varied investigations require the aid of many special branches of pure science, as *chemistry*, *physics*, *geology*, *microscopic botany* and *zoology*, etc. It is most intimately associated with the departments of *physiology* and *general pathology*, to the latter of which in particular it forms the natural supplement. It is, perhaps, this wide diversity in the objects of its work which has prevented hygiene from obtaining an earlier recognition as an established branch of applied science, and which has led many to suppose that its researches should be left to the various branches of science whose services it employs. But it can safely be affirmed that under such circumstances hygiene could make but very little advance as a science. If the special chemical researches of hygiene, for example, were left to the department of chemistry they would probably never be pursued, as the discoveries of greatest hygienic importance would not be of especial value to chemistry as a pure science, nor would they promote materially its development. That these researches may be pursued, it is therefore necessary to establish the branch of *hygienic chemistry*, just as it was found indispensable to the interests of agriculture to create that of *agricultural chemistry*. And so it is with all the other pure sciences upon which hygiene depends. Nor can general pathology, with which it is most intimately connected and from which it cannot be separated by any sharply-dividing line, absorb the work of hygienic research without an undue extension of its own limits and methods of investigation. In a general sense hygiene ends, it is true, where pathology begins, but we cannot well determine the various external influences which seriously or permanently affect the health without at the same time investigating the mode and the character of the affection, and so hygiene must necessarily include within its legitimate sphere of activity a portion of the researches of general pathology, and cannot be divorced from it. If, then, hygiene is to be established on a firm basis as an independent branch of science, and its interests are to be zealously promoted, it must have its own temples and votaries; special laboratories must be built and equipped with all the needful appliances for the varied class of investigations, and men must be employed whose

life services shall be devoted to the single pursuit of these multifarious special researches.

But how are such Institutes of Hygiene to be established, and by what means are they to be maintained? In Germany and other European countries they are supported, as we have seen, by the government, and unquestionably this is a work which should be taken up and maintained by government everywhere. *There should be, at the least, several large and fully equipped hygienic laboratories permanently located in different parts of this country*, and, as this would involve the expenditure of large amounts of money, it should be the care, as it is the duty, of our national government to provide the means for their foundation and continued support. Unfortunately the character of our general government is not such as to inspire the hope that Institutes of Hygiene would be maintained by it in any proper and adequate manner. The work, it is evident, must be carried on uninterruptedly for years, if it is to have any real value. It cannot be productive of results if liberally supported for a year or two and then neglected, as was the work of the National Board of Health. If these laboratories were dependent on annual congressional appropriations, they would be liable at any time to have their means of support cut down or wholly withdrawn, according to the caprice of Congress, without any regard being paid to the character and importance of their work. Unless they could be made independent of congressional interference they would lead a very precarious existence. If founded by the general government they should be established in some such way as were the agricultural colleges, and thus put forever beyond the control of Congress. Unless some such plan could be adopted, it cannot be denied, as our government is constituted, that their prospects of usefulness would be much brighter if they were maintained by the separate States, or permanently established on an independent basis by means of private benefactions. The great expense involved is the only practical difficulty in the way of these methods of establishing them, and this is by no means an insuperable obstacle.

Whatever means are employed to establish them—whether they be founded by the national government, or supported by state aid or by private endowments—they should, some of them at least, be established in connection with our medical institutions. There are several reasons in favor of this. An intimate relation subsists be-

tween a very important part of their work and that of some branches of medical science, and the work as a whole is naturally associated with the department of medicine. The hygienic laboratories require the services of men of medical training for many of their researches, and it is from this professional class, more than from any other, that their staff, which is to be trained to the work of special investigation, should be recruited. But aside from these advantages to the hygienic laboratories, their connection with the medical schools would be the means of promoting instruction in hygiene at these institutions. This is an important consideration. We naturally expect the physicians of the country, by virtue of their training and position, to be the leaders in all efforts to advance the sanitary interests of the single communities in which they reside and of the public at large. As a class they have the best and most frequent opportunities of judging the conditions of our surroundings, as regards their effects upon health. They should, therefore, be qualified to detect the presence of unsanitary arrangements and to instruct the people in regard to necessary local sanitary improvements, as well as to advise the municipal or general governments what public sanitary measures should from time to time be adopted. They need, consequently, to be familiar not only with the general principles of hygiene, but also with the most recent discoveries of hygienic research. At present the medical profession does not occupy the position in these respects which it ought. There is many a physician of acknowledged therapeutical skill and experience, who remains in ignorance of the advances of modern hygienic research and who is unable to advise intelligently in regard to matters of most urgent sanitary importance. For this he has had little or no training and has not found or improved the opportunity of compensating for early deficiencies through later studies. In many of our medical schools hygiene is not taught at all, while in others the instruction is confined to a few lectures, mostly on the subject of personal hygiene.

But in order that hygienic laboratories may be advantageously added to our medical schools and the department of hygiene raised in these schools to a proper standing, it is necessary that the system of medical instruction be materially modified and enlarged, and that a graded course of study be adopted, as in other institutions. Comparatively few of the medical schools are able to have a graded course or a nine-months' term of study during the year,

and only one has as yet adopted a full four-years' course of study. Even here a fourth-year's course of study is not made obligatory, though strongly encouraged.* This much-to-be-desired advancement of medical instruction is not, however, possible unless the institutions are properly endowed; and it seems here a fitting opportunity to digress for a moment from our especial subject, in order to urge the claims of our medical schools upon the public for recognition and support. One would naturally suppose that the medical institutions would be the first to receive the fostering care of a government and the public. And yet in this country the reverse is the case. While our academies, colleges, and other seminaries of learning are frequently the recipients of liberal donations and are encouraged and sustained by the favor of the community, our medical schools, strange as it may seem, appeal in vain for aid or sympathy. No school has been founded on an independent basis; but few, if any, have received more than the most meagre endowments, while all have had to struggle for an existence and to contend against the indifference of the educated classes and the ignorant prejudices of the populace. The medical profession is the one from which the public demands the most—for which it does the least. And this notwithstanding the fact that this profession is the one above all others with whose success the interests of the public are most closely identified! It is the people in general who reap the advantage from every advance in medical science, from every successful effort to raise the standard of the profession. It is for the interests of the community, then, to aid the medical institutions of the country in the efforts both to promote the efficiency of their instruction and to advance the science which is of so great an importance to mankind. Gradually the idea is gaining ground that the work of our higher educational institutions should not be confined to the instruction of the class or the lecture room. We are beginning to realize that these institutions have another and a larger sphere of usefulness; that they

* Two other medical schools (see the very valuable section of the Annual Report of the Illinois State Board of Health for 1883 on "MEDICAL EDUCATION AND THE REGULATION OF THE PRACTICE OF MEDICINE IN THE UNITED STATES AND CANADA") announce, it is true, a *four-years' graded course of instruction*, but these institutions have been but very recently established—in 1881 and 1883—and have only three and four instructors respectively. Canada is apparently much in advance of the United States in regard to the method and the extent of her medical instruction, as *all of the medical institutions*, registered in the above mentioned report, *have a graded course of study of not less than three years, and several of them have a four-years' course.*

should be the centers of the intellectual activity of our national life, and, through the work of original research, should enlarge the bounds of our knowledge in every field of thought. In no institution of learning is this more necessary than in the schools of medicine. The medical department of a university should not confine its labors solely to the work of preparing young men for the practice of their arduous profession, but should endeavor also, through the steady pursuit of investigation, to develop the science of medicine in all its branches. In order, however, that they may be able to accomplish this work, and impart instruction as well, in the most thorough manner possible, they must be able to maintain a large and permanent staff of professors, whose time will not be occupied wholly with the work of the lecture-room or with the outside practice of their profession, but can be devoted in large part to the advancement of their various departments. They must, furthermore, be furnished with the necessary museums, pathological institutes, physiological and chemical laboratories, etc., and equipped with all the forms of apparatus which are needed for the prosecution of researches or for lecture illustration; and, finally, they must be supplied with means to pursue these investigations. Surely a greater work for humanity cannot be done in this country than through the establishment of such an institution on a firm and independent basis, nor can a grander opportunity be found for the bestowal of private benefactions.

Such, in brief, is the position which the medical schools of the country should occupy. With these schools, thus liberally and permanently endowed, there should forever be associated the Institutes of Hygiene, the work of which we have attempted in the present article to outline. Contributing in a not unimportant degree to the education of the general medical practitioner, training a certain class of men for the work of special scientific investigation, and, above all, steadily and systematically pursuing experimental researches on the etiology of disease and on other subjects of vital importance to health, they cannot fail, if properly established, to achieve a work of great and lasting benefit to mankind, the full results of which we as yet but very imperfectly realize. Shall they not, then, be established? Shall we not as a nation enter into this great work immediately and earnestly, heartily supporting it through the means of government or by private benefactions and prosecuting it to the utmost extent of our power?

Some of the Unsanitary Conditions of Country Life.

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SOME OF THE UNSANITARY CONDITIONS OF COUNTRY LIFE.

The country possesses the advantages of pure air, green fields, and sparkling waters, but we often neutralize these blessings by the commission of grave sanitary sins. The most flagrant of these sins is neglect to prevent pollution of the water-supply. The buildings stand around promiscuously without regard to the well. Throughout the greater part of this section there is a stratum of hard-pan or of bed-rock from ten to thirty feet below the surface of the ground. The earth contains some clay and holds considerable moisture. In the spring the ground is saturated with thawing snow and ice and rains, and the water filters down to the bed-rock, and flows along its surface to appear as springs where the rock crops out. The water is clear, and cool, and pure, and well adapted to all domestic uses.

A well put down to the bed-rock will generally supply water all the year. From this it follows that any saturation of the ground above the well must pollute the water supply. It seems to be thoroughly established that any place will do for a well if the top is banked up higher than the surrounding ground. We see wells in barn-yards, on the lower side of them, so that the seepage from the yard must find it way into the wells. Again we see wells under buildings, where there is no ventilation and where all manner of decay is taking place between the floor and the ground. Frequently the sink-spout delivers the liquid waste upon the surface of the ground within six feet of the well, and I have seen it nearer than that. Sometimes a trench is dug a short distance, and occasionally there is a covered drain, but that is the exception.

Privies are often on higher ground than the wells and in such proximity as to leave no doubt that the water is contaminated from that source.

Hog-pens are put close to the house to diminish the labor of caring for the swine. The floor is dug out every year and used as a fertilizer, leaving a pit from one to six feet deep. Some of these pits have water standing in them during wet weather, and have fetid mud in them all the time. This is the hog-pen par excellence, as it allows porcus to take his after-dinner siesta in his native mud. To this is sometimes added the sink-waste and droppings from the closet. In very hot weather many of these hog-pens become reeking cesspools, emitting an intolerable stench, tainting the air in all directions, and making men of sanitary proclivities long for autocratic power. A well situated near such a mass of filth becomes contaminated by seepage and foul air. The old oaken bucket may rise dripping with coolness and its contents may be to the eye a symbol of purity, but in reality it is a poison as potent for death as that quaffed by Socrates.

On the premises I now describe the well is twenty-six feet deep, and the top of the well is six feet higher than the floor of the hog-pen. The distance from the well to the hog-yard wall is fifteen feet. It is stated that a well like this, in porous soil, will drain an area of sixty feet in diameter. The hog-pen is always kept wet with sink and other waste, and as the water-supply fails in dry weather, the well receives from this pestilential pool a saturated percolate, reeking with the products of vegetable and animal decomposition and heavily freighted with the germs of disease and death.

In this house four persons contracted typhoid fever in seven years. One was a walking case; three were severe cases with one death. If this house be taken as a center, and a circle be described with a mile radius, it will include twenty families and five cases of typhoid fever. The well-water left a slippery feeling in the mouth, did not quench thirst, had a foul odor, and showed that it contained organic impurities when tried by the permanganate of potassium and sugar tests.

In another locality the hog-pen and closet were within twelve feet of the well. The water was unusually low, "was too bad to use." Three cases of typhoid fever occurred in that house at one time.

A house situated on the upper side of the street had all the surroundings in a most unsanitary condition. The privy, sink-spout,

and hog-pen were all together, just above the well. The stench from the premises was so great that passers-by protested. On the lower side of the street, about sixty feet distant, is a tenement house containing several families. They get water from the well on the premises described above. Five cases of diphtheria, with one death, occurred in the tenement house. These cases were all sick at the same time, and aside from the pollution of air and water no cause of contagion could be discovered.

The practice of putting milk on shelves near the kitchen ceiling in winter, now happily almost abandoned, is fraught with danger to health and life. The milk tastes and smells unwholesome. All the vile odors of the room are concentrated in the milk, and I am satisfied disease may be communicated by it. I observed the following cases: — A's child was exposed to diphtheria while visiting in a neighboring town. Five days after I was called to see him, and found a well-marked case of diphtheria. The kitchen was used as a sick-room, and a dozen milk-pans stood on the shelves over his head. I directed that the pans be taken down, and the milk carried one hundred yards from the house and thrown away. B had four children. The youngest, two years old, was fed principally on milk which was bought from A. The houses were nearly a mile apart. The milk was carried by one of A's older children, who was not allowed to enter B's house. In six days B's youngest child developed a fatal case of diphtheria, and a few days later the three remaining children had a mild attack of the same disease. No other cases occurred at that time. That the contagium was conveyed by the milk seems to me the most reasonable hypothesis to account for the infection of B's child.

The milk was not "wasted as the doctor ordered," but was skimmed and fed to two pigs about ten weeks old. They both died in less than a week, but this fact was carefully kept from me, and when I accidentally discovered it, it was too late to make a post-mortem.

Many of the older houses are built upon the ground with an air-space of from a few inches to a foot or two. All kinds of refuse collects in such places, and as there is no possibility of cleansing or disinfecting, no vegetation, and no sunlight, the ground becomes saturated with waste beyond its power of oxidation, and ill health may result from this cause. Vegetable material is

washed there by rains and driven by winds. Small animals carry bones and other food under the house, and perish there themselves. Drippings from the mopping of open floors, decaying wood, mould and other fungi, must, after a time, set up a condition anything but healthy. When the cold weather comes these houses are banked with earth, sawdust, leaves, manure, — whichever is most available. The surface of the surrounding ground is frozen, and thus hermetically sealed. It follows that any sweating of the earth, or movements of air or gases in the soil, must work up through the unfrozen ground under the house. As the temperature is always above the freezing point some decomposition goes on all the time, these gases mingle with the others, and all winter rush through the cracks in the floor into the living-rooms above. Fortunately, most of that class of houses have been rocked by the wind, shrunk and warped by sun and rain, until the entrance of pure air from without balances in most cases the vitiated air from beneath.

Most cellars are constructed so they cannot be ventilated. They are dark holes under part of the house. Sometimes there is a small window, but this is banked up in winter. Here apples and potatoes rot, cider works, the food gathers mould, and sunlight never comes. The walls are mildewed and wet, the floor-joists rotting, the air is oppressive and damp and chill and dead. The light burns dimly, but "it is the best cellar in town for keeping cider."

When I point out these defects I am often asked: "Why don't we have more sickness?" The answer is plain. When the ground is frozen oxidation is at a minimum or entirely in abeyance, and as the waste cannot penetrate the frozen earth it accumulates on the surface.

The spring thaws and rains wash it away while the ground is yet frozen, distributing it over a large surface where the earth and vegetation rapidly remove the noxious properties. The average population per house for this town is four, consequently the amount of waste as compared with the oxidizing surface of earth and plant is very small. It is when the filth is stored up, as in the cases cited, that disease follows. Another reason is, that our community is composed mainly of adults past middle life, and does not offer much pabulum for the zymotic diseases. Out of a population of 827 we have 180 of school age. Typhoid fever is a dis-

ease of young adult life. Scarlet fever and croup are children's diseases. Diphtheria may attack almost any age, but eight-tenths of the deaths are in children under the tenth year.

To discover how these diseases originate, in what the contagion consists, how it is transferred, is a most interesting field for speculation, and a most promising field for earnest workers.

Do bacteria cause the disease or only carry the contagion? Can these diseases originate, *de novo*, from unsanitary conditions, or must there be a living morbific principle derived from some preceding case? Can foul exhalations produce typhoid fever in one patient, dysentery in another, and diphtheria in the third? These are mooted questions. In diphtheria some pathologists say: "No bacteria, no diphtheria." In culture fluids we see a constant struggle for supremacy going on between different species of bacteria. We know that they may become more or less malignant by the conditions of culture and it is reasonable to believe that the same thing takes place in the human body, one kind crowding out another, becoming harmless or virulent as conditions favor. Drs. Wood and Formad say substantially (Sup. No. 17, National Board of Health): It seems altogether improbable that bacteria have any direct function in diphtheria, that they enter the system as bacteria, and develop as such in the system and cause the symptoms of diphtheria. It is, however, possible that they may act upon the exudation of the trachea, as the yeast plant acts on sugar, and cause the production of a septic poison which differs from that of ordinary putrefaction, and bears such relation to the system as to, when absorbed, cause the systemic symptoms of diphtheria.

The practical points are: —

That the zymotic diseases are diffused by a miasm or contagion, and that unsanitary conditions, even if they do not generate the morbific principle, afford it a genial habitation, and thus directly aid in the diffusion of these diseases.

That they may be largely, if not entirely, prevented by isolation, vaccination, and proper sanitary precautions.

In Connecticut, last year, there were 1,100 deaths from these diseases. 650 children under the age of ten perished. Dead from preventable diseases, might truthfully be written on nearly every tombstone. Lives wasted with all their wonderful possibilities. What are these Herods that make such havoc among our little ones?

Are they mighty kings before whose omnipotent decree our bruised hearts must bow in hopeless, voiceless agony? No! They are low-born ruffians, begotten of decomposition, nurtured amid stenches, perpetuated and potentized by filth. They loiter in sink-spout and pig-sty, in cesspool and sewer, to seize upon our little ones, to silence their prattling voices, still their baby hands, quiet their pattering feet, and tear our treasures from us, leaving only saddened memories and church-yard mounds. Little mounds, but to our aching hearts "wider than the star-sown vagues of space."

Sanitary Drainage of Tenement Houses.

By WM. PAUL GERHARD, C.E.,

NEW YORK CITY.

SANITARY DRAINAGE OF TENEMENT-HOUSES.*

By Wm. Paul Gerhard, Civil Engineer, New York City.

The term "sanitary drainage" has a peculiarly important meaning if applied to the class of buildings generally known as *tenement-houses*.

Broadly speaking, the word tenement-house signifies any building for rent, occupied by several families living independently of each other. It includes, therefore, a large number of buildings, which have sprung up within the last few years in some of our largest cities, and which are usually called "apartment-houses," or "flats." We shall, however, exclude the latter and limit our remarks more particularly to buildings in cities, intended as Laborers' Dwellings or Workingmen's Homes. These are the buildings of which we usually think when speaking or reading of *tenements*, associated with which word are thoughts of indescribable misery, poverty, squalor, and filth, overcrowding, disease, epidemics, infant mortality, as well as intemperance, loose morals, vice, and crime.

Under such modes of living an isolation in case of an outbreak of epidemic disease becomes much more difficult than in the case of private dwellings or cottages, and the ill influence of bad drainage in particular upon zymotic diseases makes itself more keenly felt. Add to this the general slovenliness in everything relating to domestic cleanliness, the usual bad state of overcrowding, the tainted condition of the atmosphere, and the lack of sun-

* The writer has endeavored to confine himself in this paper to a plain statement of the ordinary defects in plumbing, and to a brief summary of rules for a proper method of "Sanitary Drainage." Those readers who are in search of *detailed* explanations and arguments will find the subject fully discussed from the author's standpoint in his books: '*House Drainage and Sanitary Plumbing*," published by D. Van Nostrand, 2d Edition, 1884, N. Y., and "*Hints on the Drainage and Sewerage of Dwellings*," published by W. T. Comstock, N. Y., 1884.

The State Board of Health, and the writer, are under obligations to Wm. T. Comstock, Esq., publisher, for the permission to use for this paper a large number of cuts from the writer's second-named book.

shine in most of these buildings, and it may be easily understood why the mortality-rate, especially that of infants, is so extremely high in buildings of this class.

"The effect of this arrangement of houses," says Charles E. Brace, Esq., "upon the morals of our population, is even more disastrous. In many quarters of the city, family life and the feeling of home are almost unknown; people live in great caravansaries which are hot and stifling in summer, disagreeable in winter, and where children associate together in the worst ways. In many rooms privacy and purity are unattainable, and young girls grow up accustomed to immodesty from their earliest years. Boys herd together in gangs, and learn the practices of crime and vice before they are out of childhood. Even the laborers' families who occupy separate rooms in these buildings have no sense of home. They do not own the house nor any part of it, nor have any interest in it. All that valuable industry which, in the country, a mechanic or laborer applies in odd hours to his little homestead is here lost. The workman spends his leisure hours in the grogshops or at the corner groceries. The general effect of the system is the existence of a proletaire class who have no interest in the permanent well-being of the community, who have no sense of home, and who live without any deep root in the soil, the mere tools of demagogues and designing men."

For ages sanitarians have agreed upon the truth of the old proverb, "*mens sana in corpore sano*," but not until lately has it been more generally recognized that to *live healthfully we need healthful surroundings.*

Let us, then, strike at the root of the evil: before we try to raise the moral habits of a tenement population, let us endeavor to improve the sanitary condition of the workingmen's homes.

In justice to our architects it must be said that they had little if anything to do with the planning of tenement-houses until a few years ago, and it is equally true that since the last few years, when public interest was aroused in this question, a marked improvement in the planning and arrangement of "improved laborers' dwellings," erected in some of our large cities, is apparent.

To the writer's mind there would seem to be no better and worthier deed for philanthropists, no problem more interesting to the architect, no question more important to the *practical* sanitarian, than the improvement of the homes of the laboring class in large

cities, for the decent poor are the ones that through sheer necessity are compelled to live in such generally wretched abodes, and hot-beds of disease, vice, and crime.*

The sanitary requirements for tenement-houses are many, but most of them can be provided for without undue sacrifice of economy in building. On the other hand, it is now accepted as true, that landlords or owners, who pay proper attention to the sanitary condition of their houses, will soon be amply repaid by receiving better rents, besides having in their tenements a better class of tenants.

With the exception of the lowest, filthiest class of people—the depraved, vicious, criminal—all tenants will appreciate better sanitary appointments offered to them, and will strive to keep the tenement in proper and cleanly condition.

Among the chief sanitary requirements of tenement-buildings, are:

Personal safety (fire-escapes, ample stairs, strong ceilings);
Pure air, and efficient ventilation;
Plenty of light;
Plenty of space to prevent overcrowding;
Proper drainage and removal of all household wastes;
Plentiful supply of wholesome water;
Proper garbage disposal;
Thorough dryness of cellars and foundation walls.

We limit our consideration to the correct features of a proper removal through plumbing fixtures of the liquid and semi-liquid wastes, in particular of all excretions of the human body, and this is what may be called *sanitary drainage*. Incidentally, other requirements will be referred to, for the serious evils of faulty plumbing-work are intensified through bad ventilation, insufficient lighting, and bad planning with reference to location of plumbing fixtures, while closely connected to a proper arrangement of water-closets is the requirement of a never-ceasing and liberal supply of water for flushing these fixtures.

A proper system of drainage should remove at once, and with great thoroughness, all liquid wastes from the household, together

*See "How the Poor Live," by George R. Sims, London. New York: Scribner & Welford.

with the excretions from the human body, to which is sometimes added, the complete removal of surface and sub-soil water. The latter function is important to insure a dry and healthy soil, and to prevent the dampness of habitations, which is a frequent cause of neuralgia and rheumatism, and tends to predispose people to consumption and pulmonary diseases. All foul wastes must be *instantly* removed, for should stagnation occur, putrefaction of the organic matter will soon begin, and gases of decomposition commonly known as "*sewer*" gases—although they are to a large extent generated in human habitations—will endanger the purity of the air of the building. There cannot be the slightest doubt that a large number of preventable diseases, especially those known as "filth-diseases," owe their propagation and spread to germs or micro-organisms, living and multiplying in such gases of decay, and if this is so, it is at once apparent how important it is so to arrange a proper system of tenement-drainage as to prevent any entrance of sewer-gases.

Entrance of sewer air into dwellings is always due to one or more of the following causes:

1. *A defective system of pipes and pipe-joints.*
2. *A defective method of trapping.*
3. *A defective arrangement of fixtures.*

DEFECTS IN THE PIPE SYSTEM.

Under this heading we will consider the pipe connecting the house to the sewer, commonly called the house-drain, although house-*sewer* would be a more correct expression; the vertical soil and waste-pipes, the air-pipes, and vent-pipes, the leader or rain-water pipes, the pipes for yard drainage, for cellar-floor drainage, and finally, the drain pipes, removing the subsoil-water from the site of dwellings.

As the most serious among defects of the house-sewer should be mentioned *leaky joints*. That part of the house-sewer which is outside the house is generally laid with vitrified pipes. In most tenement houses built previous to the last few years, no attempt at jointing the pipes was ever made. The spigot end of one pipe was simply inserted into the socket of the next pipe, thus leaving a large space through which part of the filthy liquid from the household settled away into the ground. It is probably assumed by ignorant builders, or drain-layers, that no harm can result from

such mistaken economy. Most of them are entirely indifferent, even if told that a serious contamination of the subsoil near habitations will result from such a pernicious practice. The effect of such leakage on the house-sewer is a quicker choking through accumulation of solid matter left stranded in the pipes.

Accumulations, or even stoppages, are increased by the faulty, haphazard manner of laying such pipes without regard to alignment or grade. Instances are frequent where pipes slope toward the house instead of toward the sewer. Another cause for accumulation of foul matter is the mistaken notion prevalent among builders and drain-layers, that the larger the pipe is the less chance there is for stoppage. Unfortunately, it is just the other way. The smaller a house-sewer is made within the limits of desired capacity, the more readily will it keep clean. For tenement-houses, having a population not overfastidious in their habits, and having a large number of families living independently of each other, and not having, as in the case of private dwelling-houses, a responsible head of the household, a house-sewer should not, as a rule, be smaller than six inches diameter. Even if the greatest care has been bestowed upon the drainage apparatus in building the tenement, the pipes are often made the receptacles of rags, brushes, potato-parings, sticks, ashes, and other substances, not intended to be removed by the pipes, and frequent stoppages are the result.

The house-sewer is often continued of vitrified pipe through the cellar-wall, and into the building, and where no more care upon its joints and the details of pipe-laying is bestowed than outside the building, the soil under it is soon converted into a large cesspool. The pipes frequently break where they pass through the foundation walls, if these settle away, and the whole or a large part of the house-sewage may thus be delivered into the ground, while a long time may elapse before such defect is even noticed or remedied.

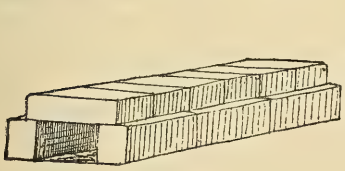

FIG. 1.

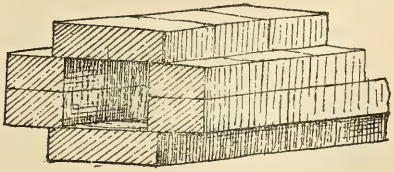

FIG. 2.

Brick conduits (Figs. 1 and 2) under the cellar floor are frequently built to act as sewers. Their shape is generally square, the

bottom flat, and the sewage spreads on it in a shallow stream, the velocity of which is too small to remove deposits. The mortar used for such brick-drains is often of the poorest kind; sometimes the conduit is even built of stones, laid dry. (Fig. 3.) Such drains frequently choke up, or they collapse. They are often found completely filled with a putrid filth, the accumulation of years.

In the last few years iron plumber's pipe has been used for the house-sewer inside of buildings. For tenement-houses light soil-pipe, *i. e.*, pipe having a thickness of only $\frac{1}{8}$ inch, is used almost

FIG. 3.

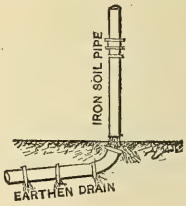

FIG. 4.

exclusively. This pipe has well been called a "trashy" article of manufacture, for it is often full of cracks or sand-flaws, which defects are occasionally covered up with a coating of coal-tar pitch. The joints in light soil-pipe, owing to the weakness of the hub, are seldom properly made, so as to be able to withstand internal pressure when tested.*

In the case of contract work, especially in tenements built by the speculative builder, almost anything else but lead is used for filling the space at each joint. Putty is largely stuffed into the joints, or cement, mortar, red lead, mixed with putty, and other substitutes. Occasionally a joint is filled with paper and sand. Possibly a small amount of lead is poured on top of such fraudulent joints to give them the appearance, at a hasty examination, of being properly made. Such examinations of the plumber's work were not often made in tenement-houses, owing to indifference of both owner and contractor. Testing the pipes and joints by water pressure, or by the smoke or peppermint test, was never thought of. The consequence is a steady leakage of sewer gas from the top of the joint, and drippings of sewage at its bottom.

*For an account of a recent test of light and heavy plumber's soil-pipe, of various makers, and of lead-caulked joints in such pipe, see the *Sanitary Engineer*, Vol. 9, No. 1 (December 6, 1883).

Branch drains were connected to the main house-drain with right-angled junctions causing eddies and deposits in the pipes. The junction between soil-pipes or upright waste-pipes and the drain in the cellar was equally defective. Sometimes the horizontal drain settles away from the upright pipe, and through the large aperture between both pipes, sewage matter is poured on to the ground, instead of being carried away in the pipes. (Fig. 4.)

What we have said of imperfect joints in the horizontal iron drain-pipes is equally true of upright soil and waste-pipes. There are few, if any soil-pipe stacks in older tenement-houses that are not defective in material as well as in workmanship. In buildings erected more than twenty years ago, it is common to find lead

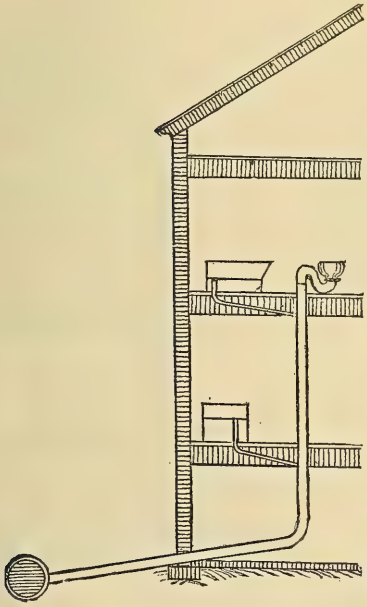

Fig. 5.

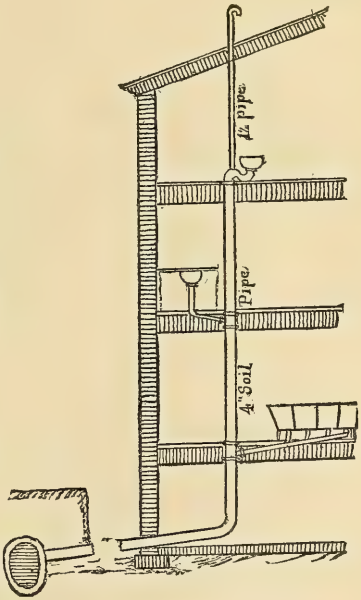

Fig. 6.

pipe used for large soil and waste-pipes. This is at least equally, if not more objectionable than the common light iron soil-pipe. For lead pipes are soon corroded and honeycombed by the action of putrid soil-pipe gases; moreover, they are apt to sag and settle on account of their weight, and they are exposed to the danger of having nails driven through them, a frequent cause of unexplained

bad odors in older houses. The corrosive action on lead pipes is aggravated by the entire lack of ventilation of lead soil-pipes put in buildings, twenty years or more ago. Such is equally true of iron soil and waste-pipes, and of smaller lead and iron waste-pipes. (Fig. 5.) The writer has been shown, in a plumber's shop, cast-iron plumber's soil-pipe, which had been in a building about seven years, corroded and perforated with numerous holes on account of stagnation of sewer-gas in the soil-pipe.

In tenements of more recent date an attempt to ventilate the soil-pipe is occasionally made by running a small pipe up to and through the roof. (Fig. 6.) Of course, such a small opening on

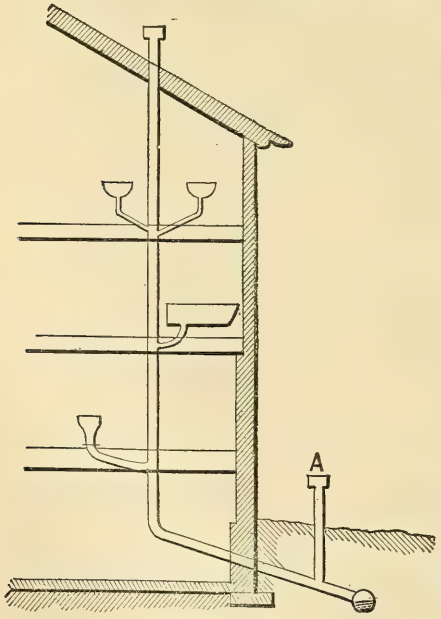

Fig. 7.

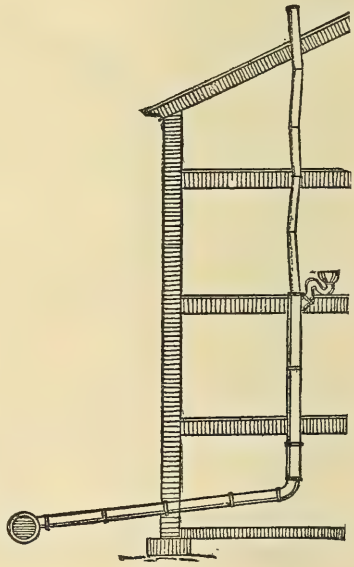

Fig. 8.

the roof is of little use, unless a second opening at the foot of the house-sewer is made. Even if this is arranged, the soil-pipe ought to be extended at least full size through the roof. (Fig. 7.) Such vent-pipes are often run with galvanized sheet-iron or tin pipes (Fig. 8), which are absolutely inadmissible for such purpose in good work.

To locate the soil-pipe top near attic windows or near ventilating shafts or chimney tops is another error of construction which

causes at times sewer-gas to return through these channels into a building. Smaller waste-pipes, if run through the roof, are often found clogged in winter time, through snow or hoar-frost. No pipe extension through the roof should, therefore, be less than four inches in diameter.

The top of soil or waste pipes, if extended through the roof, is most always covered with a "ventilating" cap (Fig. 10), (probably so-called—*lucus a non lucendo*—because it does *not* help to ventilate), or with a return bend (Fig. 11). The object of these contrivances is to prevent any malicious choking of the soil-pipes through stones or other articles which mischievous children of a tenement-house population are very apt to throw into the pipes. There is no

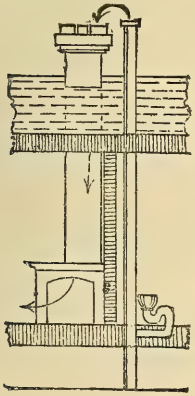

FIG. 9.

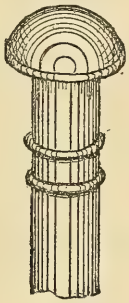

FIG. 10.

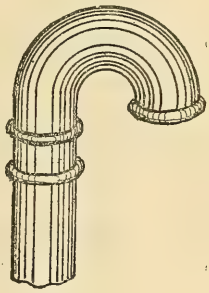

FIG. 11.

doubt that an open-mouthed soil-pipe acts more efficiently than a pipe covered with a cowl or cap. Wherever possible, pipe extensions in tenement-houses should be run at least six feet above the roof, and preferably higher, the mouth being then left entirely open. Where this cannot be done a copper wire basket on top of the pipe will prevent the throwing in of larger articles, or else some of the simpler forms of cowls may be used; all of these being preferable to the return bend, which greatly impedes ventilation.

The foot opening, commonly called fresh-air inlet (A., Fig. 7), is not found in any but the most recently-built tenement-houses. Occasionally a reversed current occurs at such inlet, and a puff of "sewer-gas" is driven out at the opening. It must, therefore, in order to be inoffensive, be located away from windows. But for

the danger of its clogging in winter time through snow and ice, it would be best to run the fresh-air pipe to a catch-basin at the curb, covered with an air grating. Wherever there is a strip of parking between the building and the sidewalk, a manhole may

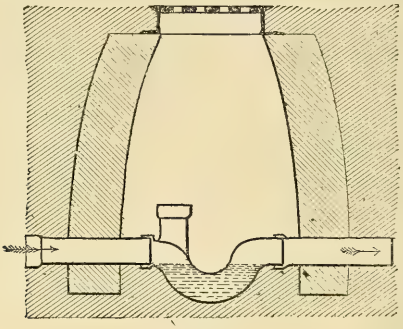

Fig. 12.

be built in which the trap is placed and the fresh-air pipe may terminate in this manhole, which may be covered with an open grating to admit the outer air. (Fig. 12.) Instead of a manhole an inspection shaft is occasionally built of glazed terra cotta pipes covered with an open grating. (Fig. 13.)

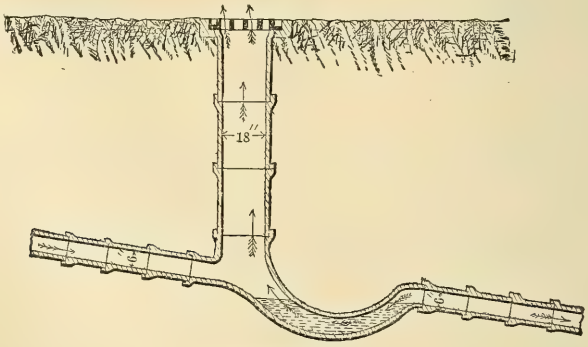

Fig. 13.

Of the smaller branch waste-pipes, of overflow-pipes, and drip-pipes we shall speak when discussing the plumbing fixtures.

Leader or rain-water pipes should not, if inside a building, be made of metal, and they should not, as is so often the case with tenement-houses, serve as soil-pipes, or as vents for soil-pipes.

Pipes for yard drainage should be of ample size to remove the rain-water falling on yards, and should join the main house sewer by proper Y branches.

The house-sewer has often a branch running to a gully located in the cellar floor to remove cellar water. Such an opening from the main house-sewer into the cellar is decidedly objectionable and there is rarely a necessity for it. It is often the cause of the flooding of cellars where sewers are gorged by storm-water or where the tide backs up into the house drain. The foul deposit left and spread in such cases on the cellar floor may become the cause of serious disease in tenements.

Drain-pipes, if such are used for the drainage of the sub soil of tenement-houses, consist commonly of what is called a "blind drain," this being a trench dug with some fall and filled with loose broken stones along or under the foundation walls. It generally connects with the house-sewer, and even if trapped causes the sewer air to enter the cellar in periods of drought. There must always be a thorough disconnection between such drain and the house-sewer.

DEFECTS OF TRAPPING.

Wherever there is an opening in the drainage system inside a dwelling, a barrier or water-dam is or should be placed on the line of the waste-pipe to prevent gases of decomposition from

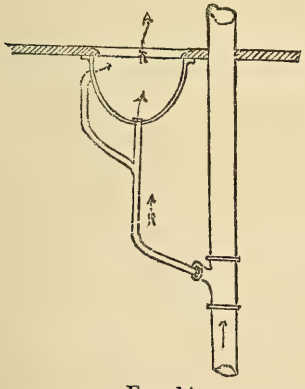

FIG. 14.

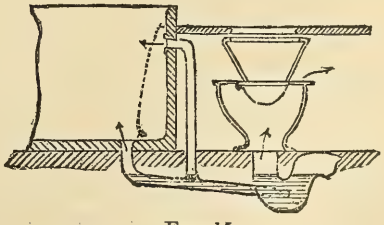

FIG. 15.

entering through such opening. Such barriers are called "traps." Defective trapping of drains and fixtures is, next to defective pipes and joints, the most frequent cause of the entrance of sewer air into tenement-houses.

The most serious defect is the entire absence of traps under fixtures (see Fig. 14), caused either by criminal carelessness or stupidity of mechanics, or else through equally criminal intention of "skin" builders or contractors. I do not refer in this connection to special systems of soil-pipe ventilation with induced downward currents through trapless fixtures and into the pipes, which systems however cannot, in my opinion, be considered reliable *at all times*. They are certainly entirely inapplicable to the drainage of tenement houses.

Not less defective is a method of trapping frequently found in older buildings by placing one large trap at the foot of the soil-pipe serving for a number of plumbing fixtures on different stories. A little reflection must convince any one that enough sewer gas is created in the soil-pipe stack, in the branch waste-pipes, and in the overflow-pipes which are then in open communication with the interior of the building, to cause serious sickness.

It is yet much more common to find several fixtures on one floor and close together, trapped by only one trap (for instance, a

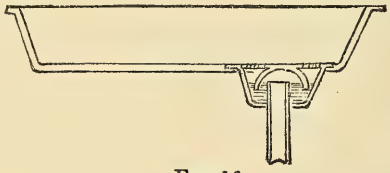

Fig. 16.

water-closet trap), into which the wastes from the bath tub or the sink, if this is near by, or from a bowl are run below the water-line. (Fig. 15.) A slight sagging or displacement of the trap is sufficient to render the trapping ineffective. What is, in such case, to prevent putrid gases from the water-closet container from escaping at the bath or sink? On the other hand the foul water of the water-closet trap is apt to back up a long distance in the bath waste, keeping it continually foul and allowing the foul water to evaporate at the opening in the bath-tub.

In recently-built tenement-houses we may find a separate trap under each water-closet, sink, and tub. But here is not the end of defects. The sink trap is usually a bell-trap, in combination with a loose strainer in the bottom of the sink. (Fig. 16.) Bell-traps are the worst possible devices for disconnecting sinks from the drain-pipes. Their seal is always quite insufficient, they readily

choke, and what is worst, in cleaning the sink the loose strainer is readily lifted and all sorts of rubbish brushed into the waste-pipe, which is thus stopped up at frequent intervals. As long as the strainer is removed soil-pipe gases can readily pass into the

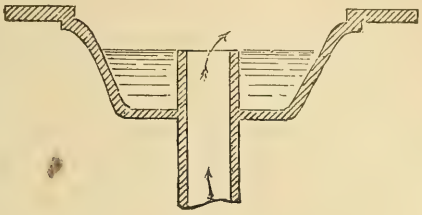

FIG. 17.

kitchen. (Fig. 17.) At times such strainers are not even replaced or else they may be lost and entirely forgotten. The tenants, who are almost always ignorant in regard to such subjects, will then be constantly compelled to breathe sewer air and, with unventilated soil-pipes and untrapped connections to foul street-sewers, the tenements are literally turned into "hot-beds of disease." To realize the possible consequences of such defective sink arrangements we must bear in mind that in tenement-houses the kitchen most always serves as a living-room and not unfrequently as a bed-room. Can we then wonder at the frequent occurrence of scarlet fever or diphtheria with children sleeping in such pest-holes ?

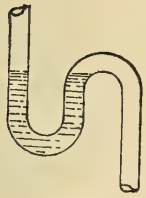

FIG. 18.

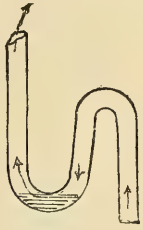

FIG. 19.

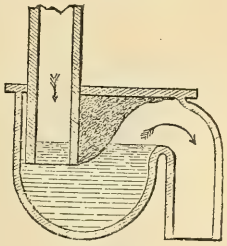

FIG. 20.

A few tenements have possibly an S trap (Fig. 18) under the sink. This too is open to severe objections. If a discharge from a sink or water-closet of an upper story occurs, the rush of water past the sink waste connection may create sufficient suction to remove a part or all of the water in the S trap by siphonage, leaving the opening in the sink unprotected against soil-pipe gases. (Fig. 19.) If the vertical waste-pipes are not extended through the roof,

back-pressure in the pipes often forces bubbles of noxious gases through the water-seal of the S trap, which rarely exceeds one and one-half inches in depth. Furthermore, with unventilated soil and waste-pipes, the water in traps constantly absorbs gases which are afterwards given off at the house side of the trap. Occasionally a sink or tub is not used in an empty tenement for a long period of time, and as the water in the traps is subject to constant evaporation, a passage is soon open for the entrance of the deadly gas, which saturates walls, ceilings, floors, and greets the new tenant when he moves in with its faint, peculiarly musty odor.

In the cheapest sort of tenement-houses the water-closets are sometimes left entirely untrapped, or else there is but one trap at the foot of the soil-pipe meant to serve for all closets on that stack. The pipe itself is as described before, generally unventilated. Sewer gases continually enter the tenements, and this condition of things occurs occasionally where the water-closets are placed in a bedroom, or in a small closet adjoining a sleeping-apartment. It is no exaggeration to say that the man who is guilty of such construction is committing murder or manslaughter, and should be tried in the courts for such offence accordingly. The atmosphere

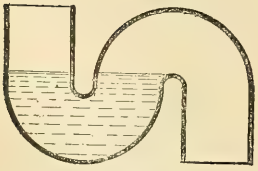

Fig. 21.

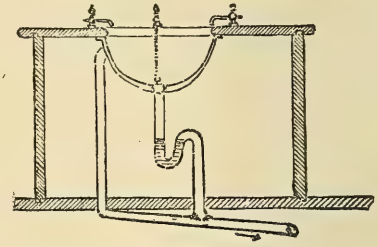

Fig. 22.

is seldom better if the water-closets are placed in some dark, unventilated place in the stair-case hall. The rooms are in close communication with the hall, and as this has usually no ventilation whatever, the atmosphere of the rooms is poisoned by degrees.

Should the water-closet have a trap it is in old houses of the D shape, which is readily converted into a receptacle of filth. (Fig. 20.) Where S traps are used (Fig. 21) they are almost always unprotected against siphonage, loss of seal by momentum, back pressure and absorption of gases.

Some of the better class of tenements have bath-tubs, wash-

bowls, or laundry-tubs. The wastes from bath-tubs or bowls are either untrapped or trapped by an unventilated running trap, which is quickly siphoned. The overflow-pipe is often connected to the waste-pipe beyond the trap. (Fig. 22.) Laundry tubs show the same defects.

Drip pipes to remove water from "safes" in case of leakage or overflow are generally directly connected to the soil or waste pipes. Sometimes they are trapped, but the water in such a trap readily evaporates, leaving an open passage for gases. Such an arrangement is therefore equally unreliable.

A further serious defect is the absence of a trap on the main drain. (Figs. 5, 6, 7, 8.) If the tenement sewer is untrapped the pipes within the building are filled not only with gases of decomposition due to organic matter attaching to the inside of soil and waste-pipes, but the gases from the street sewer freely enter the

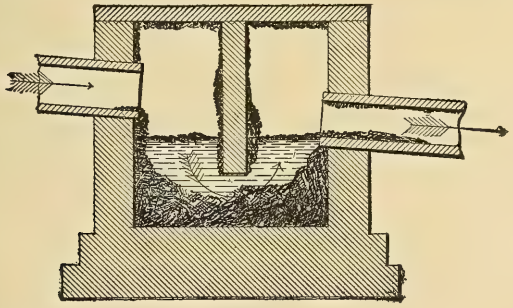

FIG. 23.

house. The conditions are infinitely worse if the tenement sewer discharges into a cesspool. Unventilated soil-pipes thus become a perfect reservoir holding sewer gases, and the latter are constantly passing into the living-rooms. This condition of affairs accounts for the overwhelming stench and nauseating odor pervading some tenements from cellar to attic. Drains of older buildings are sometimes cut off from the sewer or cesspool by a large brick trap, generally known as a "mason's or cesspool trap." (Fig. 23.) This soon accumulates filth as shown, and is extremely objectionable on this account.

There is often a gully in the cellar-floor (Fig. 24), to remove water from the cellar, and this is generally trapped by a bell-trap, the defects of which have been explained heretofore. But even

where an S-trap is used, evaporation soon destroys its water-seal, and noxious sewer air freely enters the cellar. Such openings from the drain in the cellar floor are extremely objectionable in all buildings, and should never be permitted in tenement-houses.

The yard drains for removal of surface water are generally trapped by a "cesspool" trap, which is a bell-trap similar to the

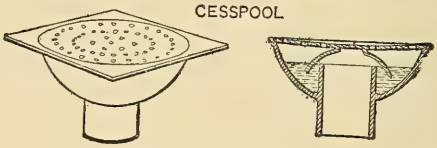

FIG. 24.

trap in the cellar floor. This freezes in winter time, or clogs from dirt, and creates in both cases, an intolerable nuisance in the yard; in the summer time its water evaporates and the children of the tenement-house population, when playing in the yard, are compelled to breathe sewer-air, even if they are out-of-doors. Bad odors are frequently carried into basement rooms, owing to foul and untrapped yard-drains. Untrapped leaders are fully as bad in this respect, and the ordinary seal of an S trap has not sufficient resistance against evaporation during periods of drought, if placed at the bottom of a rain-water stack.

DEFECTS AS REGARDS FIXTURES.

Plumbing in tenement-houses is usually restricted to water-closets and kitchen sinks. Occasionally a slop-sink or slop-hopper is placed in the stair-case hall for the common use of all families on each floor. It is not often that laundry tubs are fitted up; the common portable wash-tubs are in general use, and are emptied into the sink in the kitchen. A bath-tub in a tenement, although very desirable on the score of cleanliness and health, is looked upon as a luxury, and is only fitted up in the higher-priced tenements.

Fixtures are often scattered about in tenements, instead of being placed in vertical groups. The consequence is that a large number of branch waste-pipes are run between floors, to the distant soil-pipe, generally without any fall, and almost always with sags and bends in the pipe, caused by insufficient support of the pipes, and likewise from the effects of the contraction and expansion through changes of temperature.

The general arrangement of the plumbing work is usually such as to make a thorough sanitary inspection very difficult. This is true, not only as regards the fixtures, but also as regards the traps and the pipes. It is the result of the pernicious tendency to bury as much of the plumbing as possible out of sight. To quote from a paper on "House Inspection," by Professor Fleeming Jenkin of Edinburgh:

"It is commonly supposed that to investigate the sanitary fittings of a house thoroughly, it would be necessary to rip up floors, tear down panelling, break open plaster, and lift the pavement of the ground floor. . . . . With a more rational system of arranging the plumbing work in a house, the pipes could be readily inspected without this demolition, and it is heartily to be desired that architects should give their minds to arranging every pipe so that every yard of it can be seen with little trouble, and repaired without incon-

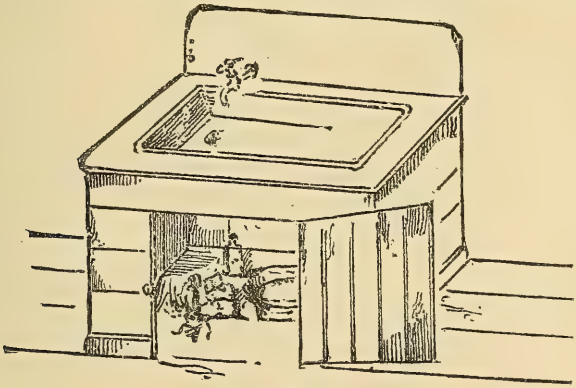

FIG. 25.

venience. . . . . The first principle an engineer is taught in the drawing-office is this: every part of a machine must be readily accessible for inspection and repair. The water and drain systems of a house constitute a large and complex system, but architects and builders have sadly neglected this condition of accessibility."

The sink, which is always placed in the kitchen, is usually enclosed with tight carpentry. The space underneath the sink is used for the storage of all kinds of rags, musty shoes, dirty towels, and other filth (Fig. 25), and an indescribable odor is escaping from such never-aired enclosure, as well as from the sink itself, which, as mentioned above, is rarely properly trapped. Large

tenement-house families use the kitchen not only as living and dining room, but also as a laundry, and frequently as a bedroom, and with the usual absence of any ventilation, the atmosphere of such a tenement-house kitchen—a pestiferous mixture of noxious gases from the drains, foul vapors from boiling of soiled linen, odors from cooking, and exhalations of filthy bedding—is such as completely to overpower the organs of smell of any casual visitor.

However, the atmosphere in the water-closet apartments is something infinitely worse. This is due largely, as we have seen, to the bad manner of trapping the closets. But the apparatus is in itself cause enough for the bad odors. Water-closets in tenement-houses

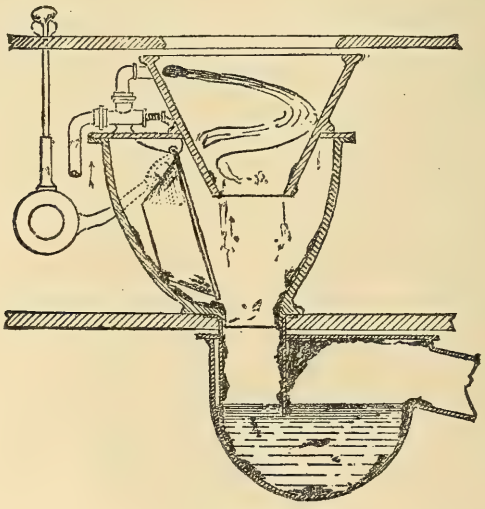

FIG. 26.

are, with rare exceptions, either pan closets (Fig. 26) or bad hopper-closets. So much has been said about the utter worthlessness of pan-closets for all purposes, that I may well omit to mention their faults. They are retainers and containers of human filth, and should not be tolerated in any place intended to shelter human beings.

There are good and bad hopper-closets. As the latter are, unfortunately, the cheaper ones, they are preferred by most builders of tenement-houses. They become extremely filthy and disgusting in appearance, owing largely to the improper method of flushing directly from the supply pipes, and furthermore, owing to the often

insufficient water-supply. For it frequently happens that the water-pressure in the mains is so much reduced as to allow the water to rise only to the lower stories, or the supply-pipe is, on the score of economy, so small, that if water is drawn on a lower story, water does not run at any of the faucets in upper stories. Water-tanks are extremely rare in tenements, and pumps to force the water up to them still more so. Thus the closets often remain without a flush, and this is more liable to occur in day-time, when the closets are in greatest use.

A serious danger to the water-supply is caused by such insufficient pressure in the supply pipes. For if the flush is started, no water flows into the closet-bowl; *there is often a strong suction into the supply-pipe*, and polluted air and possibly disease-germs—occasionally even foul matter from the bowl—are sucked into the pipes, thus poisoning the drinking-water. Whoever is in doubt about any illness due to pollution of water through such defective closet arrangement should read the report by Dr. Buchanan, on an outbreak of enteric fever in Caius College, Cambridge, England.*

There should be placed over each closet, or group of water-closets, a suitable flushing-cistern. Hopper closets, especially, require such a flushing-cistern with a large supply-pipe from the cistern to the closet-bowl, so that the water may come down in a large quantity, and with such rush as effectually to cleanse the bowl and expel all foul matter from the trap.

Not content with supplying the tenement with a defective and unsanitary water-closet apparatus, the builder encloses the fixture with tight carpentry, and finishes the whole with a faulty arrangement of the seat, whereby the latter and the wood-work become spattered with slop-water or urine, should the closet be used to pour out chamber slops, or be used by men or boys as a urinal. The floor in the apartment is kept continually damp through such spilling or through leakage of the closet valve. Woodwork readily absorbs foul liquids, and constantly emits noxious odors, which, combined with the foul gases from soil in the closet-bowl, and soil-pipe air, issuing from defective traps, defective joints, and defective drip-pipe connections (Fig. 27), all suffice to exert an unwholesome influence upon the health of delicate women and children during even a short stay in such places.

* See Reports of the Medical Officer of the Privy Council and Local Government Board, England, New Series, No. II. 1874.

Water-closets for tenement-houses are often placed in the cellar of the building. This is objectionable on many accounts. The cellar is usually dark, damp, and ill-ventilated. Important as it is to have water-closets located in well-lighted and well-ventilated rooms in private dwellings, it is imperative to give to water-closets in tenements a proper location. Darkness in such a case is identical with misuse of the fixtures, uncleanliness, general bad habits, vice, and even crime. Not only should there be a liberal water-supply on each floor of a tenement, but there should be water-closets on every floor as well. These will greatly add to the comfort of the laborers' wives, and of invalids. Water-closets placed either in a cellar or in an out-house in the yard are further objectionable,

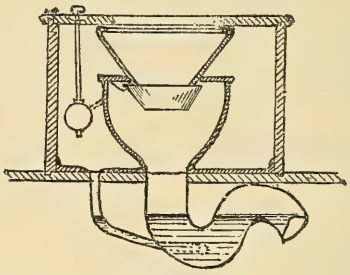

Fig. 27.

as none of the tenants will feel the responsibility of keeping such places in decent condition. The arrangement might answer, where a janitor takes care of the whole tenement, but this—although desirable for many reasons—is rarely the case.

In double tenements, with four families on each floor, there is often, owing to defective planning, want of space to locate the water-closets in a proper place. They are, therefore, placed in a bedroom, or in a dark, unventilated closet adjoining it. Such a location cannot be too strongly condemned. The diseases believed to be caused more or less directly by defective water-closet arrangements are many and serious. There are, first, the bowel diseases, such as diarrhœa, dysentery, cholera; then we have enteric fever, diphtheria, scarlet fever, typhus fever; furthermore, we have sore throat, erysipelas; finally, we have diseases due to blood-poisoning, such as septicaemia, pyaemia, and a vast amount of puerperal fever. But aside from acute illness, such wholesale poisoning of the air in bedrooms results in general debility, lowering of vitality, frequent

headache, nervousness, asphyxia, nausea, etc. It is well known that the human system has less resistance to such evil influences during sleep. *It is, therefore, absolutely inadmissible to place a water-closet or any other plumbing fixture in any sleeping-apartment of a tenement.*

Less dangerous, though not much better as regards cleanliness, proper use and danger from bad gases, is the arrangement of the water-closets—or the bath-room, if such is provided—in a small room or closet, adjoining the main staircase hall. These rooms are usually dark and without any provision for frequent change of air. The unwholesome gases, finding no other exit, soon pass into the staircase hall and fill the whole tenement. The water-closet rooms must either have an outside window, or else they must receive light and air from a special light and air shaft. By arranging the closets on different floors in vertical groups, such light and air wells may be constructed without great additional outlay of money. The Plumbing Regulations of the New York City Board of Health require "*shafts not less than three square feet in area in tenement-houses, to ventilate interior water-closets.*"* It seems hardly necessary to add that such water-closet shafts should not be used to ventilate living or bed-rooms of a tenement. Less generally understood is the fact that such air-wells, as usually constructed, are of little avail in establishing a ventilation of the water-closet apartments. The air in air-shafts, *open only at the top*, is most of the time in a state of stagnation, and chemical and microscopical analysis readily reveals its unwholesome pollution. Ventilation signifies change of air, *i. e.*, the expulsion of fouled air, and its continuous and gradual replacement by pure air. To do this effectually, *two* openings are always required. Such air-shafts should therefore communicate with the outer air not only at the top, but at or near the bottom as well. An effort is being made lately to substitute for such air and light-shafts open courts, at least for the better class of tenement-houses, thus giving to every room or closet on each floor a direct opening to the outer air.†

A fixture which becomes not less foul and ill-smelling than a water-closet is a slop-hopper or a slop-sink. It is sometimes ar-

* See Regulations of the New York Board of Health for *Light* and *Ventilation* in Tenement-Houses.

† The writer is indebted to J. C. Collins, Esq., Chief of the Division of Tenement and Plumbing Plans at the New York City Health Department, for valuable information on this subject.

ranged in double tenements, with three or four families on one floor, to empty slops into, especially if the water-closets are located in the basement or in the rear yard. The water remaining in the trap of such slop-hoppers is foul and is only driven out by a further addition of foul water. Moreover, the whole surface of the sink becomes coated with a filthy slime, and emits not less sickening odors than those from the water in the trap. If water is poured down through one of the sinks on upper floors, the traps of sinks on the lower floors, located on the same pipe-stack, are almost always emptied by siphonage, and the trap of the upper sink loses its water through momentum. An opening is thus made for the entrance of soil pipe gases. Whenever special slop-hoppers or slop-sinks are fitted up, they must be constructed similar to water-closets. They must be thoroughly trapped, and must have a flushing cistern to thoroughly cleanse the sink and trap after each use.

Such is, briefly stated, the prevalent condition of the drainage apparatus in many tenement-houses. A large share of the blame rests on the "speculative" builder who studies not how to economize, but how to reap the largest amount of profit by using cheap, worthless materials and employing inferior workmen. Part of the responsibility devolves on the plumber for taking contracts at prices at which he knows a perfect and substantial job cannot be done. Finally, in not a few cases where the owner is willing to pay for plain but good plumbing, the plumber's ignorance or dishonesty or both must account for untrapped drains, unventilated soil-pipes, and ill-arranged fixtures.

There is but one remedy for this condition of affairs; it is the thorough inspection by competent inspectors, employed by the city health authorities, of all buildings hereafter erected. Such inspection during construction will be of the greatest service for tenement-houses, the population of which is unable, even if it recognized the serious evil, to help or to protect itself. Inspections of the drainage system, however, are desirable for *all* classes of dwellings; first, because much of the work is of necessity hidden from view after the building is completed; second, because even dwellings of the better class may be rented or change their owner.

Plumbing work in all tenements hereafter to be erected should be done according to some code of standard rules compiled by the Board of Health or sanitary authorities. Many large cities, for

instance, Washington, New York, Brooklyn, Chicago, Boston, Philadelphia, and several smaller cities and towns, have such rules in force, and the success of such system of plumbing, inspection has been marked everywhere.

As a guide in establishing such rules the writer offers the following:

SUGGESTIONS FOR THE "SANITARY DRAINAGE" OF TENEMENT-HOUSES.

SYSTEM OF PIPES.

Wherever a sewer is built in the street or at the rear of a lot, the tenement must be connected to such sewer through a proper pipe conduit, and no cesspool must be permitted for the drainage of such tenement and lot. Each tenement-house must have an independent sewer connection.

For the house-sewer outside the building use strong vitrified or cement pipe. Use iron pipe if the ground is made ground or in quicksand.

Earthen or vitrified pipe must be perfectly straight, circular and true in section, of uniform thickness, free from cracks or flaws, hard burnt, smooth on the inside and highly glazed.

Cement pipe should be made of best Portland Cement, true in section, of a sufficient thickness and rendered as smooth as possible on the inside.

Cast-iron pipes should be not less than three-eighths inch thick, of a uniform thickness, truly cylindrical, of a homogeneous texture, with smooth inside surface, free from flaws or other defects, and coated with coal-tar pitch, or an equivalent substance, to prevent corrosion.

Joints in vitrified pipe and in cement pipe should be made with pure Portland Cement. Particular care is required in filling the bottom part of the joint thoroughly with cement, and in preventing any cement from protruding at the inside of joints.

It is important that the pipes, whether earthen, cement or iron pipes, should be firmly bedded in the trench. Grooves must be cut for the hubs in order to give a firm bearing to the whole length of the pipe.

The house-sewer must be laid at least three feet deep to protect it against frost.

The house-sewer must be laid in straight lines, and changes of direction should be made with curved pipes of large radius. All branch drains must join the main house-sewer by Y branches. Tee branches should never be used for junctions. If the house-sewer is unusually long it is recommended to provide manholes as a means of access in case of repairs or inspection.

Before refilling the trench the pipe line should be tested by hydraulic pressure.

For tenement-houses with more than four families it is seldom safe to use a smaller size than six inches diameter for the house-sewer except where the tenants can be relied upon to use the plumbing fixtures with intelligence and proper care. In the latter case a five or four inch sewer would have ample capacity and would prove to be more self-cleansing.

The ordinary velocity of flow in the house-sewer should not be less than three feet per second, and a velocity of four or four and one-half feet is desirable. The inclination to be given to the house-sewer must be determined accordingly. A six-inch pipe requires an inclination of 1 in 138 and 1 in 61.2 to create a velocity of flow in the pipe of 3 and $4\frac{1}{2}$ ft. per second respectively. This is true supposing the sewer to run full or half full. As the ordinary or dry-weather flow from all plumbing fixtures in a tenement is not at all likely to fill a house-sewer *half full*, it is evident that a greater inclination than above stated is necessary to prevent deposits in the pipes. The inclination should be calculated with reference to the *maximum* flow of household waste-water exclusive of storm-water.

If the required inclination cannot be given to the house-sewer it is extremely desirable that means for frequent artificial flushing should be provided for.

The house-sewer inside of the tenement *must* be of heavy iron pipe.

It should preferably be carried *in sight* along the cellar wall, supported at intervals by strong brick piers.

If it must be laid below the cellar floor, access-holes and cleaning hand-holes must be provided and the trench must not be closed before the drain has been inspected.

Cleaning hand-holes should be provided near all junctions with branch drains or with vertical soil and waste-pipes, also at or near the running-trap and near bends.

The pipe-system in the cellar should be as compact and concentrated as possible. If the rain-water is taken into the house-sewer, it is well to connect leaders with the upper ends of the drains, thereby securing an occasional thorough scouring to the *whole length* of the house-sewer.

As to the size and inclination of the house-sewer inside the dwelling, follow rules given for outside drains.

No junction should be made at right angles; all changes in direction must be accomplished with Y branches and 45° bends, or with 90° bends of large radius.

All soil, waste, and air-pipes inside of a tenement-house should be of heavy iron pipe (with the exception of the short branches from the fixtures).

Each soil-pipe, waste-pipe, and air-pipe must have thoroughly air and water-tight joints and the pipes must be of a sound material, free from any defect.

Soil and waste-pipes must always be arranged as direct as possible. Each stack should run up perfectly straight, if possible. The fewer offsets the stack has the better. Long branch wastes under floors must be avoided. All this can be readily attained in tenement-houses by placing the fixtures of different floors one above the other in vertical groups.

It is preferable to keep all soil, waste, and air-pipes in sight. If they are placed in recesses or in partitions, these should be covered with wooden boards fastened with screws and readily removable. No pipe should ever be buried entirely out of sight.

Where water-closets or bath-rooms are located around a light-and-air-well, it is to be recommended to place the pipes in this shaft.

Waste-pipes for vertical groups of kitchen sinks in tenements should run, wherever practicable, along the outside of a heated flue (kitchen chimney), as this will further an upward draft in the pipes.

The soil-and-waste-pipe system must be thoroughly ventilated and should have no long "dead ends" of pipe. Each soil-pipe and each waste-pipe must extend as straight as possible, and at least full-size from cellar to above the roof. (Fig. 28.)

The extensions above the roof should in all cases be not less

than two feet high, so as to expose the pipe-mouths freely to currents of air.

Pipe extensions above the roof must be located as remote as

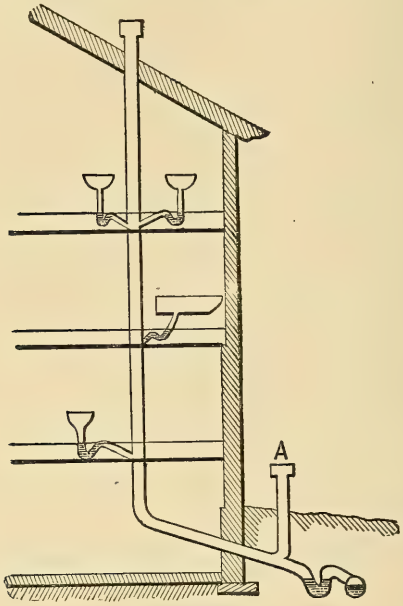

FIG. 28.

possible from ventilating shafts, chimney-flues, ventilating skylights, air-and-light-wells, etc.

No pipe extension through and above the roof should be less than four inches in diameter; smaller pipes clog up in winter time.

All pipe-mouths above the roof must be kept *wide open*. None of the numerous patent ventilators are preferable to an open-mouthed pipe. It should be remembered that the object of soil and waste-pipe extensions above the roof is, above anything else, to prevent stagnation of air in the pipes. No violent air-currents are required in soil or waste-pipes. Return-bends on top of a pipe cause stagnation and are objectionable on this account; so-called ventilating caps freeze up and prevent ventilation in winter time.

To protect pipes on roofs of tenement-houses from malicious obstructions run the extensions at least six feet high above the roof.

To insure a full circulation of fresh air through the pipes, a fresh-air inlet-pipe A (Fig. 28), of four inches diameter, must be

provided in the house-drain, preferably located just inside of the trap in the drain, and its mouth run to a point well remote from windows.

Soil-pipes should not be larger than four inches inside diameter, which size of pipe will answer even for half-a-dozen or more water-closets and sinks.

Vertical waste-pipes for kitchen sinks or tubs need not be larger than two inches diameter; where they receive discharges from slop-hoppers they should be made three inches in diameter.

Each stack of soil or waste-pipe must have fittings (Y branches, half Y branches or Tee branches) in proper position and at proper height to receive the flow from fixtures. It is preferable to discharge each fixture directly and separately into the upright stack, and this is easily accomplished where the soil-pipe system is located in a light shaft.

Junctions between horizontal branch wastes and vertical soil-pipes need not be made with Y branches; Tee branches, especially if the flow line is arranged in an easy curve, are not objectionable, nor is it objectionable to run the small wastes from tubs into large soil-pipes by means of right-angled connections. An oblique connection in the direction of the flow is *desirable*, but practical considerations favor a direct right-angled connection.

Vertical pipe-stacks must be strongly supported at the junction with the horizontal main sewer in the cellar in order to prevent settlement, which would tend to loosen the joints at the fixtures. The junction must be made with a Y branch and 45° bends or with an elbow-fitting of large radius.

For soil-pipes and vertical stacks of waste and air-pipes use either heavy cast-iron pipes or wrought-iron pipes. Both must be efficiently coated, after being highly heated, with coal-tar or asphalt, or else they should be treated with the Bower-Barff, or other rustless process, to prevent corrosion in the pipes. Both cast-iron and wrought-iron pipes must be tested *before use* under hydraulic pressure for any defects in the pipe. Both must be truly cylindrical and of a *uniform thickness* of *not less than one-fourth inch.* Cast-iron pipes must be especially closely scrutinized for *uniformity* of thickness of shell.

Joints in cast-iron pipe must be made by inserting a gasket of picked oakum into the joint and pouring molten soft lead from a large ladle into the remaining space. After cooling and shrinking

the lead must be thoroughly caulked with caulking tools to insure *tight* joints.

Joints in wrought-iron pipe are made with screw threads cut

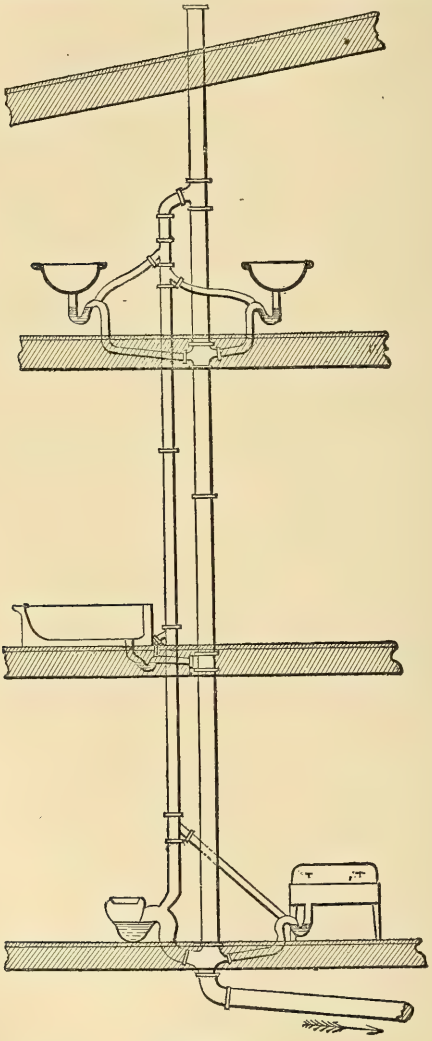

Fig. 29.

on the ends of pipe and into the shoulder of fittings. A paste of red and white lead mixed is used to act as a lubricant and to make up for imperfections in the thread. The pipes are screwed

together by means of chain pipe-tongs and the joints must be made as tight as if the pipes were to carry steam under pressure.

Vertical lines of air-pipe must be of cast-iron with well caulked joints or of wrought-iron with steam-tight screw joints. Each line should be as straight as possible and be at least two inches in diameter, increasing at the upper floors, as the height of the building increases, to three and four inches diameter. The upper end of air-pipes is either run through the roof (never smaller than

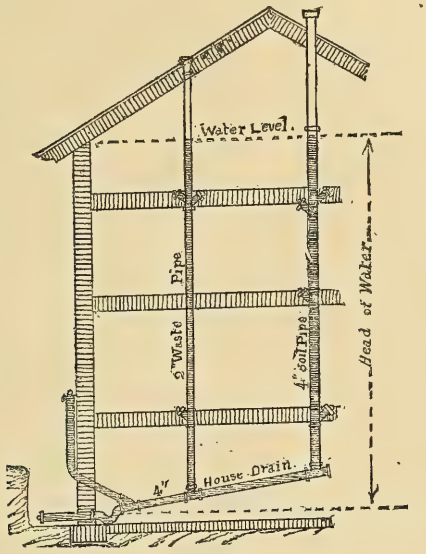

FIG. 30.

four inches in size) or it is branched into the adjoining soil or waste-pipe above the highest fixture. (Fig. 29.)

Each vertical line of air-pipe must have fittings of proper size to connect branch air-pipes to it.

Air-pipes must not be used as waste or overflow-pipes.

To run air-pipes into flues is as inadmissible as running soil or waste-pipes to flues. Smaller pipe-ends would stop up with soot in a short time. Soil-pipe gases are gradually absorbed by the porous bricks. If the flue ventilates any room, or if it is a chimney flue, there may be at times down drafts, carrying soil-pipe air into the rooms.

No flue of sheet-metal, earthenware, or brick should be used

for ventilation of soil-pipes, waste-pipes, drain-pipes, or for trap ventilation.

No soil or waste-pipe in a tenement-house should be used as a leader.

No soil, waste or air-pipe system in a tenement-house should be accepted as completed before its tightness has been tested by the water-pressure, peppermint, smoke test or test by a force-pump and manometer. If the joints do not leak under severe pressure-tests the system of pipes may be considered safe against entrance of sewer-air. (Fig. 30.)

It is a good practice to keep a plan of all drain-pipes, junctions, branches, traps, access-holes, etc., as a guide in case of future examination or repairs.*

Short branch-wastes from the fixtures to the soil, waste, or air-pipes should be of wrought-iron or of lead pipe. Branch-wastes should always be as short and direct as possible, and as little as practicable of the pipe should be hidden under floors. If running under floors, horizontal lead pipes must be continuously supported to prevent sagging.

Connections of lead pipe with cast-iron or wrought-iron pipe-stacks should be made with brass ferrules, connected to the lead pipe with wiped joints and caulked or screwed tightly into the iron pipe.

Joints in lead pipe should always be wiped joints except joints between fixtures and traps, which may be cup joints.

Branch waste-pipes of lead should be of the following sizes:

For a kitchen sink,	$1\frac{1}{2}$	inches diameter.
" bath-tub,	$1\frac{1}{2}$	"
" basin,	$1\frac{1}{4}$	"
" set of laundry tubs,	$1\frac{1}{2}$	"
" slop-sink,	2	"

*It is not practicable in the climate of our Northern States to locate soil-pipes, as is commonly done in England, outside of the house walls.

It is not necessary to discharge basin, tub, and sink wastes over an open gully or grating in the cellar, as is recommended in English plumbing regulations.

It is also perfectly proper to connect basin, tub, or sink wastes to a soil-pipe, if such is near and convenient. A special waste-pipe is arranged in American plumbing, not for the sake of keeping the tubs or sink-wastes separate from the water-closet wastes, but in order to render the horizontal branch-wastes as short as possible and to avoid cutting of beams.

The weight of lead pipe should be *at least:*

2 lbs. for $1\frac{1}{4}$ inch pipe.
$2\frac{1}{2}$ " $1\frac{1}{2}$ "
3 " 2 "

Overflow pipes for fixtures must be as short as possible and should either join the waste-pipe between the fixture and its trap or discharge into the trap below its dip, or else they must be disconnected and discharge over a safe-pan.

Overflow pipes from water-closet cisterns may discharge into the water-closet bowl.

Overflow pipes from drinking-water tanks must never have any connection with any drain or soil-pipe. They should discharge into a gutter of the roof or else over an open sink in the basement.

Drip-pipes for "safes" under fixtures should not have any connection whatever with any soil or waste-pipe or the house-sewer. They should be run independently as straight as possible to the basement, where they should discharge over an open sink so that any leakage may be at once discovered.

Refrigerator wastes must never be connected directly to any waste, soil or sewer-pipe. They should empty over an open sink, cup or pan with thoroughly trapped connection to the soil or waste-pipe system, and this connecting pipe should be provided with a stop-cock to shut it off in case the refrigerator is put out of use.

Vertical pipes for the removal of storm-water from roofs (leaders or conductors) must be of cast-iron or preferably wrought-iron, if put inside a dwelling, and must have thoroughly tight joints. If located outside they may be of metal (copper, tin or galvanized iron). Upright leaders should not be less than three inches diameter (except for roofs of very small sheds), and their size must be proportioned to the amount of roof-water to be removed.

Rain leaders in tenement-houses should not be used as soil or waste-pipes.

Unless the rain-water is to be collected for storage in cisterns, or unless the rainfall is excluded from the city sewers (separate system of sewerage), it should be discharged into the house-sewer and some of it preferably at its upper ends.

Pipes for the removal of storm-water from court-yards and paved areas (yard and area drains) should not be less than two inches in diameter, their size being proportioned to the area to be drained. They should be taken into the cellar by the most direct route, and should join the leader-pipes or the house-sewer.

Subsoil water must be removed by drain-pipes (common tile drains) laid at a sufficient depth below the cellar floor. Tiles of one and one-half or two inches are generally quite sufficient for this purpose. They should be laid with open joints well wrapped with tarred paper or strips of cotton. They are generally run in parallel lines, their distance depending on the character of the ground. Such subsoil drains for tenement-houses in cities must never have a *direct* connection with the house-sewer or any of its branches.

SYSTEM OF TRAPPING.

The main house-sewer for a tenement-house should be trapped before entering the street-sewer or before discharging into a cesspool* (in places having no sewers). No connection with the house-sewer should be made on the street side of the main trap. The old cesspool, or mason's trap, is highly objectionable. The best drain-trap is the inverted siphon or running trap. (Fig. 31.) If located outside the house, it may be of cast-iron or of earthenware. If located inside the house-walls, it should be of cast-iron.

This trap must always be accessible to remove obstructions. If placed outside it may be located in a manhole. The trap must always be placed in a position where it is not exposed to the danger of freezing. It should have cleaning handholes, but the greatest care must be taken, if the trap is placed in the cellar, that the handholes are hermetically closed with proper covers.

It is recommended to run into the main trap a front leader, to give it a thorough scouring at each rainfall.

Leader pipes must be trapped only in case the top opens below or near attic windows, or near flues or ventilating shafts, and if the leaders are made of metal with slip-joints, and pass near windows of living or sleeping rooms.

*In cases where a city, town, or village constructs an entirely new sewer system, according to a well-devised and uniform plan, it may be possible to dispense with the trap on the main drain, *provided the drainage of all houses is subject to the inspection and carried out according to proper rules of the city authorities.*

Iron leaders, with tight joints, the tops of which are remote from windows, flues, ventilating shafts, etc., should not be trapped.

It is preferable *not* to trap leaders, but if a trap is required, it should have a very deep seal, not readily lost by evaporation. The common traps in the market are entirely insufficient for such purpose. Great care must be taken to place the trap out of reach of the frost. It is to be recommended to place the traps for leaders *inside* the cellar walls, and just before the connection with the house-sewer; the trap to be an inverted siphon or S-trap.

Yard and area drains must always be properly trapped. Bell-traps in yard-cesspools (gullies) are entirely insufficient, and highly objectionable. The trap should have a deep seal to provide against evaporation, and must be located out of reach of frost. The same arrangement as for leader-traps is recommended.

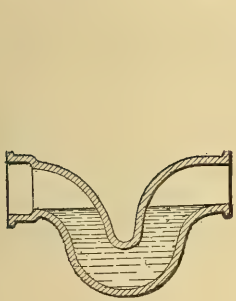

FIG. 31.

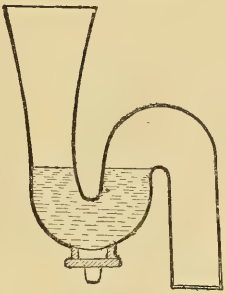

FIG. 32.

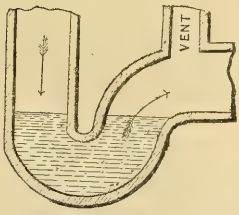

FIG. 33.

Drains to remove sub-soil water must be *thoroughly disconnected* from the main house-sewer, by a trap with very deep seal, or by a gravel trap, or a ball-valve trap.

There must not be a trap at the foot of any soil or waste-pipe stack, nor any other trap between the trap on the main drain and the trap under the fixture, which would all interfere with a proper circulation of air through drain and soil-pipes.

All branch waste-pipes connected to the soil-pipe system must be provided, as near as possible to the outlet of the fixture, with a suitable trap, secure against back pressure, siphonage, evaporation, or absorption of gases.

Overflow-pipes must be connected to the waste-pipe on the inlet side of the trap, or below its water-level, or else they must be disconnected from the waste-pipe system. A separate trapping of an

overflow-pipe, connected directly to a soil or waste-pipe, is not to be relied upon, as the seal may often be lost by evaporation. The same is true of drip-pipes for "safes", and of refrigerator wastes.

The junction between trap and waste-pipe must be made with great thoroughness, and of great strength, and so as not to be affected by any settlement of the floor.

The junction between the fixture and the trap should preferably be made movable, at least under sinks and tubs, to facilitate repairs of the fixture.

All traps should be placed as close to the fixture as possible.

Traps for water closets should not have a larger depth of seal than $1\frac{1}{2}$ or 2 inches; traps for bowls, sinks, and tubs may with advantage have a larger *dip*.

Traps should be self-cleansing, and free from corners or spaces which favor accumulation of filth.

Traps should hold as little water in volume as possible, so that the contents of the trap may be changed each time a fixture is used.

Traps should never be larger in size than the waste-pipe to which they are attached. It is preferable to have the house-side of the trap funnel-shaped (see Fig. 32), as this increases the scouring action of the flush.

Cleaning-screws or access-holes of traps should be arranged below the water-seal of the trap.

Neither bell-traps nor D-traps must be used anywhere in the drainage system.

Round pipe siphon traps (Figs. 32 and 33)—S, P, and running traps—are the most self-cleansing traps. If used under water-closets, slop-hoppers, wash and bath-tubs they must be protected against siphonage by an air-pipe (Fig. 33), preferably of the full bore of the trap, taken from its sewer-side, and at its crown, and connected to the main vertical air-pipe.

For kitchen sinks or wash-basins, placed vertically above each other, the danger from siphonage is not great; but even here an air-pipe from the crown of the trap may be required, especially if portable wash-tubs are likely to be emptied out into the sinks. A good mechanical trap is preferable to the S-trap, if the vent-pipe is dispensed with.

Where fixtures remain out of use for some length of time, as on unoccupied floors of tenements, it may be better to use one of

the better-shaped bottle-traps with deep seal, or mechanical traps, or traps having in addition to water a seal of mercury.

Air-pipes should be attached to all traps—water-seal and mechanical traps—wherever the fixtures are at a distance from the vertical soil or waste-pipe, in order to prevent any long dead ends in the pipe system.

Such air-pipes should be run with a continuous slight pitch either to the trap of the fixture or to the soil-pipe, in order to prevent any collection of water from condensation.

3.—SYSTEM OF FIXTURES.

Plumbing fixtures in tenement-houses should not be scattered, but should be located in vertical groups.

FIG. 34.

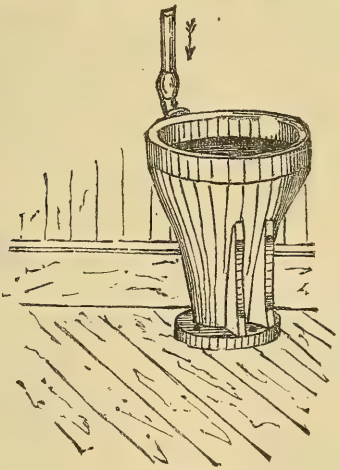

FIG. 35.

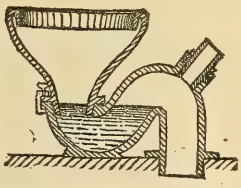

FIG. 36.

The material for such fixtures should be strong and durable, non-absorbent and non-corrosive.

The arrangement of fixtures should be as plain as possible.

There should be little if any wood-work about plumbing fixtures. An open arrangement of sinks and water-closets is to be recommended in the interest of cleanliness.

The outlets of all fixtures, except water-closets, must be protected against obstruction by a fixed strainer.

Each fixture must be separately trapped, as near as possible to its outlet, by a reliable, safe, and self-cleansing trap.

There should be an abundant supply of water on each floor of a tenement-house. Wherever the pressure is insufficient to raise the water to the upper floor, a tank at the top floor of the tenement must be provided, sufficient in size to hold one or two days' supply.

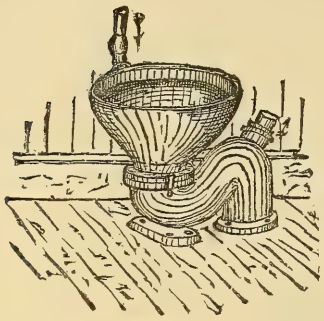

FIG. 37.

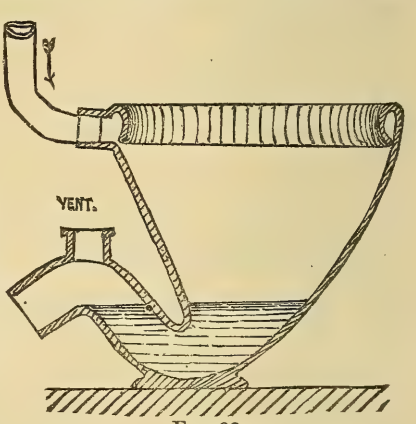

FIG. 38.

If the water does not fill such tank by the pressure in the mains over night, a force-pump should be provided.

Water-tanks for tenement-houses must never be lined with lead, galvanized iron, or zinc. Wooden tanks, or iron tanks, well

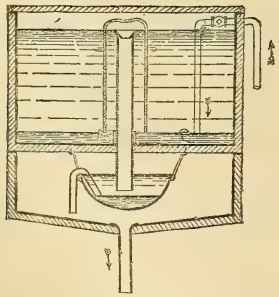

FIG. 39.

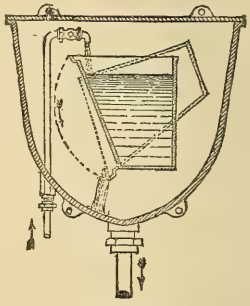

FIG. 40.

painted, or wooden tanks lined with tinned copper, should be used. The overflow of such tanks should never be connected to any soil, waste, or vent-pipe. A frequent cleaning out of water-tanks is to be recommended, especially where they are used to supply drinking-water. Water-tanks should be covered up and must be well aired.

No water-closet, slop-hopper, or kitchen sink should be arranged on tenement floors, unless provision has been made for such adequate and *constant* water-supply.

No water-closet, slop-hopper, sink, or tub should be placed in any apartment or closet of a tenement, not having a window to the outer air, or to a light-and-air-shaft of adequate size.

No water-closet, slop-hopper, sink, tub, or bowl should be placed in any living or sleeping room of a tenement-house, nor in the cellar of such building.

No pan-closet should be used in any tenement-house.

Plain hopper-closets (Figs. 34, 35, 36, 37, 38)—preferably short hoppers of improved construction—are recommended in preference to mechanical closets for use in tenement-houses.

The material for such improved hopper-closets should be glass earthernware, iron lined with glass, or enamelled (porcelain-lined) iron. Hopper-closets of glass probably approach the ideal closet more than any other kind, but they are not yet manufactured. Closets of best earthenware answer all practical requirements. Enamelled iron closets are to be preferred only on account of their strength where a very rough and careless use of the closets may be expected.

Each water-closet in a tenement-house must be flushed from a special cistern, located in the apartment at a sufficient height over the closet-bowl to insure a strong flush. This cistern must never be used to draw water for drinking or cooking purposes.

The down-pipe from the cistern to the closet-bowl must not be less than $1\frac{1}{4}$ inches diameter.

Water-closet cisterns in tenements should be operated by chain and pull-down handle, or else by seat action. The latter arrangement is preferable for careless tenants and children. Automatic flushing tanks, siphon tanks (Fig. 39), and tilting tanks (Fig. 40), discharging at frequent fixed intervals during the day, and placed under exclusive control of a janitor, are to be recommended for tenements.

Slop-hoppers must be flushed from special cisterns, preferably automatic flushing-tanks, in the same manner as water-closets. They must have strong metallic strainers to prevent improperly-thrown substances from choking the pipes.

Water-closets and slop-hoppers in tenements should always be

arranged in an open manner, and tight boxing-up apparatus should not be permitted.

The floor must be made impervious, and slate slabs are recommended for this purpose. The closet should stand free on top of such slate slab, accessible on all sides for inspection and cleaning purposes. The seat should be a plain, well-finished hard-wood board, with proper hole, and hinged at the back or one end, so as to be readily lifted, when the closet is not in use. Such open arrangement facilitates the use of the closet by men or boys as a urinal. A further improvement is to raise the closet a step, but to leave a part of the floor, wide enough to allow a person to stand between the steps on each side in front of the closet, at the common level of the room. This arrangement raises the closet-bowl to about the height of a urinal basin, and prevents spilling if the water-closet is used as a urinal.

It is much to be recommended to arrange a laundry on the top floor of a tenement-house, to be used alternately by the tenants, and kept under the control of a janitor.

A simple bath-tub for each tenement (at least of the better class) is very desirable on the score of cleanliness and health. If arranged in the kitchen, it is easy to provide even a warm bath by pouring pails of hot water from the range into the tub. It is perfectly feasible to construct such bath-tubs so as to serve also as laundry tubs.

THE ELEVENTH ANNUAL SESSION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

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AMERICAN PUBLIC HEALTH ASSOCIATION.

The following report of one of the most important sanitary events of the year—the annual congress of the sanitarians of the country—presents, of course, only a brief abstract of the proceedings. Many of the papers have been printed in the sanitary journals; a few in the medical journals. It is somewhat strange that there are so few members from this State; even if not an attendant upon the meetings, the yearly volume of transactions is of sufficient value to repay the cost of membership, and can be obtained only at that price. If names are sent to any member of the Association, of persons that desire to become members, they will be proposed at the next meeting, and assigned either to the active or associate class, as the case may be. The former manage the affairs of the society; the associate members enjoy all privileges except voting.

The city of Detroit, chosen as the place of meeting, is one of the most beautiful cities in the country, and the seat of many thriving and extensive industries. The streets are wide, and the wooden pavement is very agreeable to ride over, and is free from the noisy rattle that accompanies stone pavement. In this climate it seems to endure well, the traffic in heavy goods causing no ruts nor uneven places. The streets are well drained, and the city has a plentiful supply of pure water. As one would expect, the death-rate is very low. Eight daily papers are published for a population claimed to be 150,000. The city is finely located on the Detroit river, between Lakes Erie and St. Clair.

The occasion called together a large assembly from all parts of the country, and, from the readiness of access, quite a number of sanitarians from Canada were present, some of whom contributed papers of interest.

A convention was held, under the auspices of the Provincial Board of Health of Ontario, at London, Canada, after the adjournment at Detroit, which was attended by quite a number of those that were present at the Detroit meeting, some also reading papers, so that the interchange was very pleasant and profitable.

The attendance, while not as large as in some of the more central cities, was, perhaps, more decidedly representative than any of the previous sessions. All sections of the country were represented, and nearly every state, and, as a rule, by some one actively engaged in sanitary work. This made lively discussions and induced close attention to business throughout the whole session.

Under the skilful leadership of its honored president, Dr. E. M. Hunt, of New Jersey, whose long devotion to the cause of sanitary science is well known to all workers in this field, commencing before there was anything like the present encouragement for its pursuit, in the dark days of general indifference and even hostility, the session was one of the most successful and interesting that has yet been held. There was, especially, greater attention paid to the discussion of the topics presented than has been the usual rule, and these discussions were often fully as interesting and instructive as the papers that were read.

The papers were well grouped; those upon kindred topics were read consecutively, and thus one train of thought was not dropped here to be taken up again later, and so on repeatedly. This plan was favorable also to intelligent discussion.

CONTAGIOUS DISEASES OF ANIMALS.

The first series of papers was on the contagious diseases of animals. The first one presented was by Dr. D. E. Salmon, of the Agricultural Department of Washington, upon the Texas cattle fever, a subject upon which authorities differ—at least, upon some points. It was stated to be an epizootic, very contagious, and rapid in its course. He considered that it was indigenous in Texas, and was conveyed elsewhere by Texas cattle. He drew a vivid picture of the results of this scourge, in causing ruin to hundreds, who through it lost their all, and of the extent of territory ravaged, which included thousands of square miles. The remedy he proposed, to control the disease, was quarantine against the infection. He stated that there was no instance of the outbreak of this

disease in northern latitudes that could not be traced to imported cattle from the south. He gave a complete history of the disease from the time it was first recognized, and described its nature and treatment. In the discussion that followed, Dr. Ryan, of Texas, spoke of the fatality among imported stock in Texas, which was a great obstacle in improving breeds.

The next paper was upon hog cholera, by J. M. Partridge, M. D., of Indiana. This disease, he stated, was found principally in the great corn and pork-producing regions of the northwest, because there was the greatest amount of material to attack, rather than from any peculiarly favoring conditions in the country. Increased temperature was the most constant symptom, as high as 111° being reached sometimes. It was claimed to be caused by a special form of bacteria of the rod-shaped order—*bacillus suis*. The treatment naturally was disinfection, and germicides internally, separation of the sick at once, and change of pasture. Stagnant pools of water preserve the vitality of the germs which are not killed by freezing. These germs are found in all the fluids of the body; if inoculated, reproduce the disease, while the inoculation of the fluid in which they are found, if the germs are removed, does not produce it. The germs, it is believed, can be carried through the air two miles or so; are absorbed through abraded surfaces, but not through the skin if unbroken. They are also taken in with the food and drink.

A paper by Dr. Belfield, of Chicago, upon a parasitic disease prevalent among southern cattle, was read by the secretary, in the absence of the author. The popular name of the disease is "swell head." The rapid growth of the fungus causes a large tumor and considerable general swelling of the surrounding tissues. It is contagious and communicable to mankind.

These papers, with the discussion upon them, occupied the first morning's session. They were followed by a series by three army surgeons, and shorter papers by several other writers, upon the subject of malaria, which, with the discussions, occupied two sessions or more.

MALARIA.

The general result is well expressed by the *Sanitary Engineer:* "The papers and the discussion on malaria showed, that while the general opinion is in favor of the germ theory of causation of this disease, there is little agreement as to the conditions upon which

the activity of the supposed germs depend beyond heat, moisture, and the presence of vegetable organic matter. In the first paper Dr. Sternberg discussed the etiology of malaria, more particularly as shown by the experience of the army, commencing with the statement that the existence of malaria as a particular thing has not yet been satisfactorily demonstrated, and that the answer to the question "What is malaria?" had long been withheld from the medical profession. He gave the present *status* of the germ theory as not yet proven; that malaria is connected with vegetable decomposition, heat and moisture being the two other known factors. The fourth was probably a biological one; namely, the germ.

The evidences in favor of this were briefly mentioned. While the conditions under which malarial germs are evolved are not yet known, it is an error to suppose that they are evolved from the decomposition of all vegetable matter. If so, the farmer in his barn-yard would be especially exposed to them.

The army statistics were then analyzed, showing among other things that the proportionate number of cases increased the further south one went. The contiguity of stagnant surface water to the stations where there was a prevalence of malarial fever was noted—as at Jackson, Miss., and Baton Rouge, La.; each remarkably unhealthy and each located at the edge of a swamp. A wind blowing from the direction of these swamps was followed by a marked increase in the number of cases of fever. The dryness of the air of Arizona was given as a reason for the small amount of malaria.

The paper closed as follows—the first statement referring to the assertion that while water is essential to the production of malaria, heat, water, and decomposing vegetable matter may be present without the development of miasmatic disease:

"I would remark in conclusion that this possibility cannot be denied, and that it is even supported by observed facts. But as there is, in all probability, another essential element in the operation, an unknown biological factor, we need not be surprised at these apparent exceptions. And we cannot expect to explain all the phenomena relating to the evolution of the malarial poison until we have obtained some definite information as to the kind of decomposition upon which it depends, and as regards the life-history and conditions of development of the living ferment or ferments which are concerned in this decomposition; the physiological changes which these micro-organisms may undergo in nature's

laboratory from changes in their environment; the enemies with which they have to contend in the struggle for existence, etc."

The second paper was upon the "Etiological Association of Organic Matter with Malaria," and its principal argument was to prove the production of malaria, or rather its introduction into the system, through the medium of drinking-water. The author first, however, presented briefly several arguments why the theory of marsh exhalations, as taught by Lancisi nearly two hundred years ago, should not be entirely abandoned. The coincidental experience, so vast as to be almost universal, is not to be set aside by a few exceptional instances:

"The old story of disease that follows freshly-turned soil and newly-created marshes and disappears upon their cultivation or drying, of railroad cuts and fillings where, the natural drainage being intercepted, pools are formed and fevers follow, of primitive swamps being drained and old agues vanishing—this constantly-recurring tale should not be discredited by the occasional failure to observe the same consequences under apparently similar conditions. The experience given by the local government boards of Great Britain as to the disappearance of periodic fevers coincidently with thorough drainage, is excellent evidence, on a large scale, of the etiological relation."

If the swamp land were only one factor, it should be recognized. The modern tendency is to extend the conditions under which the poison is developed. The statement of Fayrer was quoted approvingly: "Indian experience supports the view expressed long ago by Pringle, that the chief determining cause is stagnant sub-soil water under certain temperatures."

The well-known instance of the *Argo* was given in support of the transmission of malaria by water. This was one of three ships used to transport troops from India. The three reached Marseilles on the same day. Among 680 men on board the other two ships, and out of the crew of the *Argo*, not a man was sick; but of 120 soldiers on the *Argo*, thirteen died on the passage and ninety-eight were ill with various forms of paludal fevers. The only difference was, the soldiers on the *Argo* were supplied with water taken from a marsh.

The experience in India, and the belief of the natives of that country, and its prevalence in California where shallow wells are used, were cited, among other arguments, for this theory. The invasion or migration theory was considered with reference to the

spread of the disease in New England. The author stated that "It has become a serious etiological question to account for the spread of the disease in certain parts of New England." He states that Massachusetts and Connecticut lie upon the debatable ground—the neutral territory where malaria may or may not present itself. The remark of Marston is quoted, as follows: "The absence of such specific characteristics (as ague) is no proof of the absence of malaria. Dyspepsias, neuralgias, attacks of pseudo-fibrinous rheumatism, diarrheas, anæmial and splenetic diseases, may prevail in a district in which true ague rarely if ever occurs."

The recent trial of the New Lenox case was discussed in relation to the theories of the etiology of malaria, and the prevalence of malaria in New England, and the effect upon the ground-water by the raising of the dam insisted upon as there favoring the production of malaria, as well as the surface water.

He closes with a similar conclusion to that of Dr. Sternberg. "The question is not simplified by denying the production of malarial poison from organic decomposition in ninety-nine cases because the constant antecedent has not been found in the hundredth. Another factor may have to be introduced before the equation is solved, but that does not involve the abandonment of those terms whose value is already known."

Dr. Smart also of the army, lately Secretary of the National Board of Health, read the next paper, which also advocated the transmission of malaria by drinking water, the maintenance of health where there was pure water supply, and the prevalence of disease where the potable waters are impure is well known, if charged with decaying organic matter, they produce malaria. The low lying ærial theory is not satisfactory since malaria is found in high and dry altitudes. It travels with the wind and wherever its germs go damp vegetable substances absorb it. In India, those that drink marsh waters have fevers at all times, those that do not only suffer during the hot months. Numerous cases were cited in favor of the theory of the transmission of malaria by infected water, especially that from shallow wells, including some from our own State. Shallow wells and defective cisterns are often found filled with water possessing many of the characteristics of marsh water, and at such places will be found cases of malaria, though the blame is invariably laid to a swamp or a mill-pond if there happens to be one near.

Several papers, which discussed each some features in regard to various types and varieties of malarial diseases, were then read. An animated discussion followed, different theories were advocated to some extent, but there was perhaps a more general consent as to the effect of telluric agencies, and to the germ theory, while no one attempted to give a satisfactory explanation to cover the whole ground.

In the morning of the first day's session the Association was welcomed by Gov. Begole, Dr. Brodie, and others; the governor's address was very pertinent to the occasion, and is well worthy reproducing here as a whole, did space permit; a brief extract must suffice:

"Long life has in all ages been considered a blessing to be desired. In the Old Testament it was promised to the upright and obedient. Solomon said of Wisdom: 'Length of days are in her right hand;' while in her left hand, as of inferior value, he places 'riches and honor.' The theology that affects to despise our bodies as 'vile clay,' and regards their care as inimical to the soul's best interests, cannot be teachings of Him who, during his short ministry on earth, devoted himself so largely to healing the sick, cleansing the lepers, and curing all manner of diseases among the people.

"The subject of health occupies an important place in the science of political economy. Disease among a large class means not only pain, bereavement, orphanage, widowhood, but also poverty and pauperism. The spread of contagious disease in a community paralyses trade, and, if long continued, brings financial ruin. The old maxim, 'Health is wealth,' is true both of individuals and communities. The 'labor problem,' too, becomes an important factor. Continued anxiety for to-morrow's bread will undermine the strongest constitution; nor can sanitary rules as to dress, food, cleanliness, sunlight and ventilation be carried out by those who can earn but a scant subsistence for themselves and families.

"The work in which you are engaged affects the personal welfare and safety of every citizen. In the matter of health, no person can be said to live to himself alone; indeed, it might be said that in this regard each one must be his 'brother's keeper.' Let the individual observe ever so closely the wisest sanitary laws, and it will avail little so long as his neighbors ignorantly or willfully foster the germs of disease on their premises. Diphtheria, small-pox, scarlet fever, may be bred near the dwellings of those who exercise the greatest care in their homes, and our public schools become points of contact from which these diseases are spread through cities and communities."

The address by the President of the State Board of Health of Michigan was exceedingly interesting and pertinent to the occasion, and a graceful tribute to the work of the Association. The address of Dr. Hunt, president of the Association, was an earnest, scholarly essay, creditably alike to the Association and its chief officer.

After an interesting resume of the history of the Association from its inception, and of its subsequent successful work, with much of which he himself is honorably identified, and graceful tributes to his co-workers, he proceeded to discuss the nature of its work. The claims of hygiene to recognition as a science, were duly set forth, and its progress traced from the gross ignorance of the Dark Ages, when truth was blindly groped after, through faint beginnings down to the present, when injudicious zeal must be repressed. The influence of locality in the production of disease was strongly asserted and ably defended, and the rationale of such influence described in detail. The discouraging elements received full recognition, but the conclusion that upon the whole, real and substantial progress had been made, and that the outlook for the future was brighter than ever was fully established. The address should be read as a whole; no extracts can do it justice, although there are many brilliant and terse passages that might be quoted.

The evening sessions generally were devoted to papers that were of more popular interest, and were quite well attended by the citizens.

The second day's papers commenced with a discussion of the adulteration of food, by Dr. Newton of New Jersey. The harmless ones were perhaps most extensive; thus, ten pounds of glucose are made every year for each inhabitant of the land, yet none is sold by that name. Where deleterious adulterations are likely to occur, close scrutiny should be maintained by government to protect the health of the people. In the discussion, it was held that the province of sanitarians should be confined to those that affect the health rather than those that defraud the pocket.

One of the most important papers was that of Dr. Lundy of Detroit, upon School Hygiene. The high-pressure system was denounced and the recognition of the requirements of bodily health and vigor demanded. The unsanitary conditions of school life were well presented and practical remedies suggested. In the

discussion, Dr. Reeves claimed that the elements of sanitary science should be taught in our schools, and the essentials of a healthy home taught in the higher grades. Dr. Gihon spoke of unnecessary mental torture, such as the demand for an immediate answer to such questions as "How many fifths are there in three-sixths of twenty-nine sevenths?" Several papers were devoted to the benefits of physical culture, and its claims were well presented. The time cannot be far distant when these will be generally recognized.

Dr. DeWolf gave a very interesting account of the sewerage of Pullman, a city situated upon a level plain. The following are some of the conclusions of the paper:

1. That the sewage of a town, if separated from the surface water and used on a farm in the vicinity of a market, can be profitably made into manure.

2. That capitalists can find a profitable investment in the erection of towns built on sanitary principles for the occupation of their workmen.

3. That such towns, by improving the social condition of the working classes, tend to diminish the unrest which is one great factor in capital and labor conflicts.

In this city no saloons are allowed. There are 1,400 houses; each has water and water-closets. The streets are macadamized and have broad sidewalks bordered with turf, relieved at intervals by flower-beds, trees, and fountains. It is sewered upon the separate system introduced by Col. Waring, and described in our second and third reports.

A valuable paper was upon house drainage, by Rudolph Hering. One sentence is reproduced, as it has been so many times exemplified in tracing the causes of disease, in discussing the polluted air of sewers and drains that has been in contact with decomposing organic matter, especially of an excrementitious nature. "It should be emphasized here that whatever the dangers are (from such air), it is in the house much more than in the streets that they are most disastrous to the population."

Many interesting and valuable papers were read upon almost every phase of sanitary work. House drainage and sewerage especially were very fully discussed. Dr. Oldright of Canada, presented a very instructive essay, illustrated by diagrams, upon the overhead

method of ventilating house drains. Many papers were read by abstract and some by title only.

In the evening session, a very valuable paper was read by Dr. Reeves upon the Eminent Domain of Sanitary Science. Its scope is indicated by the title, and it must be read entire to be appreciated. Fortunately it has been reprinted in one of the medical journals largely taken in this State. The following sentences from a report of Bishop Thompson's address on "Sane Humanity," deserves to be read by every one:

"Christ was a healer of man's diseases; sought to save the body as well as the soul. At all times we find Him among the sick, seeking to heal them. He came to teach the laws of God to man; to teach them how to live. To-day, the pulpit, the teacher, and the physician are all joined hand in hand. There is much to be said in support of the often-expressed theory that moral disease is a physical disease; that sin is a disease. What can we say when we see a small fragment of bone, thrust into the brain of an upright, just man, transform him into a demon? It is said that 200,000 persons die yearly of preventable diseases. What kind of civilization is this of ours that permits such destruction of life? Is it less than murder?

"When yellow fever was epidemic in New Orleans, a few years ago, many people declared that it was a judgment upon men for their sins. So it was, but the sin was not a moral one, but a physical one. Still it was a law of God, for there are laws of God that command men to keep themselves clean, both in body and in spirit. It is all well enough for people afflicted with a pestilence to resort to prayer, but while they pray with their tongues they should also pray with their hands; to go forth and destroy the birthplace of the pestilence.

"The Bishop said he had recently visited a place where the people boasted of taking God's prairie, God's river, and God's breezes and transformed them into a beautiful city, but where he found thousands of grog-shops, whole streets of brothels, a board of trade, and the Chicago river. He could but think God's creations best."

A paper on the alarming increase of insanity in this country from foreign immigration, largely from assisted emigrants, was read by Dr. Foster Pratt, Superintendent of the Insane Asylum at Kalamazoo, Mich. It was fortified by long tables of statistics from the tenth census, which were printed and distributed to the audience. The paper called out a resolution to request Congress to prevent assisted immigration.

Other resolutions were passed requesting Congress to enable the National Board of Health to resume the study of the causes of

disease, to provide an adequate fund for the continuation of the studies commenced upon yellow fever and kindred diseases, and to provide for quarantine that should be effectual.

The following officers were chosen for the ensuing year:

President—Albert L. Gihon, Washington.
First Vice-President—James E. Reeves, Wheeling, W. Va.
Second Vice-President—Erastus Brooks, New York.
Secretary—Irving A. Watson, Concord, N. H.
Treasurer—J. B. Lindsley, Nashville, Tenn.
Executive Committee—Thomas L. Neal, Dayton, O.; J. D. Gatch, Indiana; H. P. Walcott, Massachusetts; Gustav Devron, Louisiana; Chas. Smart, U. S. A.; H. D. Fraser, South Carolina.

The Secretary is elected for three years, and the former secretary declined a re-election. The duties are quite onerous, and as no salary is provided, it is quite a labor of love. The next session will be held at St. Louis, Mo.

A large number of new members were admitted. Dr. Noah Cressy of Hartford, was made an active member. The Society now has above 800 members, and the number increases every year.

During the session a meeting of the delegates from State Boards of Health was held to devise some methods for concerted action.

It was the intention also to provide for the discussion of practical questions, relating to the work of State Boards of Health, at the meetings of the Association, and to bring these boards into closer affiliation. Two methods were mentioned, viz., the devotion of one day to practical points in State Hygiene, under the management of officers of State Boards; or a modification of the present plan, so that a section on State Hygiene could be formed, like the sections of the American Medical Association. If this, upon consideration, should seem not advisable, some other plan could be provided by a committee for the purpose. It was, after some discussion, voted to appoint such a committee to report at the next meeting. Drs. C. W. Chamberlain, J. W. Reeves of West Virginia, and Stephen Smith of New York, one of the original members of the Association, were appointed a committee to prepare a plan to secure concerted action among State Boards of Health and a closer affiliation of State Boards of Health with the Association, so that something could be gained each year in practical sugges-

tions and improved methods by comparison of the ways taken by different Boards to accomplish similar ends. Drs. J. McCormack, Indiana, and H. B. Baker, Michigan, were appointed a committee to notify the different State Boards of the action taken and to request them to send delegates. Washington was selected as the place of meeting, and May, when the American Medical Association will be in session, as the time, as better attendance could be thus secured and other objects attained at the same time. The National Museum of Hygiene offered the facilities of their rooms for the meeting, if desired. Incidentally, the members could be brought into closer relations with this institution, and gain a better idea of its aims and capabilities.

It should have been stated, when resolutions were mentioned, that the National Museum of Hygiene received the heartiest support of the Association, and this, with the library of the Surgeon-General's office, with its valuable catalogue, now partly completed, and the Army Medical Museum, were recommended to Congress as worthy of a generous support.

During the session, committees upon various subjects presented their reports, which were discussed and appropriate action taken. There are quite a number of standing committees that report upon the progress made in their departments during the year and suggest such action as seems expedient.

At the close of the session a vote of thanks was passed to all that had shown courtesies to the Association. The session was characterized by a close attention to business and a general attendance upon all the sessions by nearly every member through the whole time of the meeting, although the city presented many attractions to a stranger, and for the greater number it was a first visit.

Extracts From Annual Report

TO THE

NEW HAVEN BOARD OF HEALTH.

By C. A. Lindsley, M.D., Health Officer.

EXTRACTS FROM ANNUAL REPORT TO THE BOARD OF HEALTH.

BY HEALTH OFFICER, DR. C. A. LINDSLEY, OF NEW HAVEN, 1883.

The practical lessons to be learned from the study of the death certificates are :—the death rate suffered by the inhabitants as a whole, and the inferences to be drawn from that single fact, by comparing it with the death rate of previous years, and of other communities, and so determining in some measure how New Haven stands related to its own past experience, and how her sanitary condition compares with that of other cities.

But far more important and valuable information is to be learned by making the certificates of death a guide to finding the localities in which death has been busiest, and especially to determine the relation of causation, if any exists, between those localities and the diseases which proved fatal.

It appears quite evident that if local causes make *all* the differences in the mortality of different places, the removal of those causes should make the mortality in all parts of the town no greater than in the best part. That is, if in one of the wards of the city the average death-rate is only 11, then by putting all the other wards of the city in an equally good sanitary condition, the death rate throughout the city would be only 11, instead of being over 20 as it often is in some of the wards.

While it would not be claimed by any intelligent sanitarian, that *all* the difference in death-rates, as between different parts of the city, are due to causes peculiar to the localities ; while no one would ignore the influences of race, of nationality, of heredity, of occupation, of personal habits, and constitutional tendencies, yet when all these latter influences are given full consideration, and their greatest effects allowed for, it still appears unquestionably true, that greater than all these influences over the health and lives of people, are those which result from their immediate sur-

roundings, the environment in which they live, the conditions which affect the air they breath, the water they drink, and the food they eat. To keep these pure, clean, and undefiled, to be able to possess, use, and enjoy these essential, indispensable necessities of life in their integrity and purity and undefiled by deleterious admixtures is almost the whole purpose of public hygiene.

The people need to know, and in order that they may be made to know, it is necessary to tell them in every variety of way in which the truth can be made most impressive, that *cleanliness*, public cleanliness is the highest aspiration of the public hygienist; and that *filth* in any form is the fatal foe of human life. A foe unsparing, insidious, unceasing, malignant, and deadly. Thousands of years ago Hippocrates condensed the sanitarian's creed into one sentence, viz.—"pure air, pure water, and a pure soil." Time has only verified the aphorisms of the ancient sage. These are still as ever, the essentials of health. And yet citizens of New Haven, proud of their University City, complacently confident of their own intelligence and worldly sagacity, who would resent with indignation any imputation upon their prudence in the care of their families, will live with heedless temerity in the upper stories of a cess-pool. Or if it happens the cess-pool is not *in* the cellar (as it often is), yet it is so near it, that the noxious gases generated in it are drawn through the house as smoke is through a chimney, so that this diabolical invention is practically the basement of their houses. And they will wonder why their children sicken and die; why their wives are so often ill, and why *they* always feel so much better elsewhere than at home. They have often been told that pure air is essential to health—they will not deny it. And still they go on year after year rivaling a miser, in storing their own excrement, and every other species of repulsive and loathsome nastiness in receptacles as near as possible to their houses; and especially and purposely designed to facilitate as much as possible the saturation of the soil about their homes, with these sickening and dangerous deposits. Where then is their boasted intelligence and their prudent regard for their families? It cannot be denied that a pure soil is essential to health, because without it, pure air and pure water are impossible. But if you, as a Board of Health, in the interest of these suffering and stricken families, attempt, by the exercise of your authority, to deprive these wise and cautious citizens of their odorous and odious subterranean accumulations, they

question the utility, they dispute your power, they cry out oppression! sacred rights of citizenship invaded! and resistance to the utmost is threatened.

It is said that in former times the most destructive enemy of sea-faring men was the scurvy, that in most long voyages at sea, the greater part of the crews perished from this disease, and that during the 17th and 18th century, numerous instances occurred in which important national maritime undertakings failed wholly, by reason of outbreaks of this scourge.

And yet after the discovery of the means of preventing and curing the scurvy was made known and demonstrated, it took the English people nearly seventy-five years to appreciate these means in a practical way by using them in the royal navy, and yet the prevention and cure is so perfect that *now* scurvy at sea is a rare and almost criminal event.

Can it be possible that it will require three-quarters of a century, after the construction of public sewers, for the people of New Haven to appreciate their sanitary uses and abolish the virulent fever-nests they now keep about them to poison themselves and their neighbors!

A distinguished sanitarian writes, "The general intelligence of any communities may be inferred, from the attention they pay to removing all filth, completely away, beyond the possibility of doing harm."

An examination of those parts of the town in which death has claimed most victims, confirms the oft-repeated statements, that impurities of air, water, and soil, are co-existent and conterminous with sickness and death, to a very remarkable and significant degree.

If now you will take a map of the city, such as is found in the City Directory, where the wards are distinguished by different colors, your familiarity with the topography of the city will readily enable you to recognize the wards which are kept in the most cleanly condition, and also those which are most neglected in this respect. And I scarcely doubt that you would nearly agree in pointing out those wards in which the death-rate would be largest, and those in which it would be the smallest. Your judgment being based simply upon the general appearances of the streets and houses of residents in different sections of the

city, with regard to neatness, cleanliness, and thrift on the one hand, and slovenly neglect and untidy poverty on the other.

The ward of smallest mortality, which is the 1st, has a death-rate of only 11, for the past year, while in the ward of largest mortality, the 7th, the deaths for the same time was nearly double, 21. The 2d, 3d, 4th wards rank next as insalubrious; the death rate in each being 18 to 19 per thousand. While the death-rate of the 8th and 5th, 10th and 11th being 14 to 15, show that they are next to the first in healthfulness. If these facts and figures applied only to the year just closed, it might plausibly be affirmed to be a coincidence, and without special significance. But reference to the records (as the following table shows) proves that the same peculiarity of death-rates in each ward are true, with remarkable uniformity throughout the past seven years, during which the present limits of the wards have existed.

Wards.	1877	1878	1879	1880	1881	1882	1883	Seven years Average.
I.	15	9	11	12	11	10	11	11.3
II.	16	16	15	14	15	14	18	15.6
III.	21	17	17	20	21	19	19	19.1
IV.	18	20	19	23	19	21	18	19.8
V.	13	15	12	15	13	16	15	14.1
VI.	16	15	13	13	15	19	16	15.4
VII.	25	23	20	20	25	22	21	22.3
VIII.	13	15	12	15	15	16	14	14.3
IX.	26	20	17	17	22	17	17	19.4
X.	15	13	11	10	13	13	15	13.
XI.	15	13	12	15	12	16	15	14.
XII.	22	19	19	17	16	16	17	18.3

In the above table fractions are omitted, and the approximate integer number substituted.

The difference in the death-rate of the wards would be strikingly more conspicuous if the wards were laid out with reference to their hygienic conditions rather than for political reasons. There is not a ward in the city which is at all homogeneous in its population, or in which the sanitary conditions of some parts are not widely different from those of others. As illustrations, contrast Wallace and East streets with Lyon and Williams streets in the 7th ward, the ward of greatest mortality in the city. It would be interesting to know how much the death-rate of that ward is modified by the more cleanly and better way of living of the well-

to-do residents in it west of Bradley street. So contrast Hillhouse avenue and Prospect street, where are the homes of the refined and cultivated, with Eaton and Webster streets, all in the 9th ward, the homes of poverty and thriftlessness.

Hence it is quite evident that although the disparity of healthfulness of different wards is very marked and has been constantly so for many years, yet the difference would be still more conspicuous and glaring, if the wards were so bounded as to contrast more definitely the sanitary with the unsanitary parts of the city.

Now when a portion of our city, like the 7th ward, suffers, and has suffered for all the years your Board of Health has existed, a loss of life largely greater than what is common in other portions of the city, it indicates, beyond question, that there is something radically wrong among the residents of that ward. It indicates that there is urgent occasion there for active sanitary work. It is a fact which appeals with emphatic force and earnestness to those who have in charge the interests of New Haven, to enquire into the causes of, and stop, if it be possible, this most unnecessary destruction of human life. There is responsibility for this somewhere. And those upon whom it rests cannot piously fold their hands and say, it is a special dispensation of Providence upon the people of that ward. It is not a dispensation of Providence, except as by man's violation of the laws of Providence. This suffering and afflicted portion of our fellow-citizens have rights. They have a claim upon those who govern this city in which they live, for protection and care.

They need municipal protection and care. Their condition and relations are such that they cannot effectually help themselves. Nothing but the strong arm of the law, guided by intelligence and prompted by humanity, can save this community and other similar communities, within the city limits, from continuous suffering and waste of life.

If you, as a Board of Health, have not the authority or the means to succor them, then the responsibility rests upon those who should give it to you.

It is encouraging to know that your authority is now sustained by the courts, within the past week, in matters about which there has heretofore been some doubt.

Those people take a very narrow-minded and limited view of the subject who regard the fact that there is in New Haven one or

more seriously unsanitary districts, as a matter of merely local importance. It is far more than that. The influences reach out from those plague spots into all other parts of the city with damaging effect. They reach up also from the stratum of society which seems to suffer most, into what are termed the higher and better ranks.

What is called *reflex action* in the physiology of the human system has a close parallel in the relations of the different elements which make up our social system. When an organ in the human body is diseased or injured, other organs have their functions in consequence, disturbed and deranged, and they too may in turn become diseased.

If your little boy is overfed with candy and peanuts and cake, you are suddenly alarmed by finding him in convulsions, from the relations of the brain to the outraged stomach. And the only relief for the little sufferer is to dislodge from him the indigestible mass.

In like manner the body political is composed of parts, and every individual in the community constitutes a portion of that body. There are "many members, yet but one body; and the eye cannot say to the hand I have no need of thee; nor again the head to the feet, I have no need of you." The residents in every portion of New Haven are concerned in the welfare and prosperity of every other portion. If the people of any district or section are afflicted continuously with an excessive mortality; if, month after month, and year after year, without interruption, the waste of human life is large, it implies excessive sickness and suffering; it implies discouragement and poverty and want; it implies excessive pauperism and crime; it implies domestic unhappiness and wrecked families; it implies fuller orphan asylums and poor-houses and jails; and it implies what the rich can more readily appreciate, higher taxes. Already the city has had to erect *a special police prison in its most unsanitary ward.*

It is a question which concerns every prosperous man in New Haven to consider how long it will be for his interest to allow the death-rate in one ward in the city to be double that of another.

How are the unsanitary places to be improved? It has been already stated that cleanliness is the grand aim of the Sanitarian's efforts. Whatever will promote that will promote the public health, except where there are special causes of disease.

It is not enough to tell citizens habitually neglectful, of the advantages of cleanliness. It is not enough even to have citizens convinced of its importance and desirous of it. They often need to be instructed in what constitutes cleanliness. But more especially *they need facilities for cleanliness.* The rich (if also intelligent) provide the facilities for cleanliness with the least possible cost of labor.

They realize the need of facilities for the successful accomplishment of a given object in the most practical and economical manner.

Tested by experience, it is found that without the mechanical helps which ingenuity has devised, it is not possible to remove the excrementitious matter and sewerage of city populations before decomposition renders them dangerous to health.

In this view of the subject, the question, the purely *selfish* question, arises into one of prominent gravity—to what extent does the self-preservation of a city population demand that landlords, who furnish homes for the poor, shall provide necessary facilities for the prompt removal of sewerage, and the attainment of wholesome cleanliness in and about households?

Let us briefly state the proposition again. Uncleanliness is the most active enemy of health, the busiest breeder of sickness. Sickness begets poverty. Poverty humiliates and degrades. Degradation engenders pauperism and crime, and these fill poor-houses and jails.

It is always a charity to relieve human suffering, and it is justice to punish crime. But it would be a better charity and a nobler justice to prevent both.

TENEMENT HOUSES.

It is impossible to estimate the measure of prevention which would result from a correction of some of the grosser evils of tenement-house life which the poor are obliged to endure.

The poor in cities need, and have a claim upon, the protection and care of the governing power. Visit the homes of the extremely poor in our city (they will always be found where sickness and death are thickest) and see how helpless they are in their destitution to contend with the baneful influences which surround them. Nay, you need not limit your visits to these only; but also look among the houses of the working classes, and see how often the industrious mechanic and laboring man is wronged and made the victim of his landlord's power.

The following letter, received last November, which is copied literally, only omitting names, graphically represents the situation of many families in New Haven to-day:

NEW HAVEN, CONN., November 29, 1883.

DR. LINDSLEY:

Dear Sir:—I would like to call your attention to the six-family tenement building No. —, ——— street. It is in a most filthy condition from sewer gas; the sink smells so bad that my wife cannot stand over it to wash dishes. There is not a trap in the whole building, only a straight pipe running into the sewer and connected with the privy vault. I called the attention of an officer of the Board of Health to it in the early part of September last, and he says he notified the agent, Mr. ——, of it, who says he can't do anything about it until the owner orders him to do it. So there it stands. I would like to have you inform me if there really is a Board of Health in this city. I have applied for help until I am discouraged. I have had five children down with scarlet fever, and buried one with diphtheria last summer, so I thought it about time to make complaint; but it don't seem to me any good. All the satisfaction I got was the reply, why do I live in such a place. But I suppose poverty and little children is the cause.

I would like to have you investigate the matter if it is convenient, and oblige. Yours truly, ——— ———.

Inspection of the premises confirmed fully the statement of the complainant.

Although complaint of the danger to which the six families in this tenement were exposed was made "in the early part of September," it was not until late in December, after the slow process of the law, that any correction of the abuses were made.

There is probably no class of real estate property which returns to the owner a higher rate of rental, in proportion to its value, than that which the laboring poor people occupy. Their poverty and their position in the social scale combine to hinder them from asserting their rights and defending them. They need the protection of constituted authority. It is rank injustice to allow them to be compelled to live amid such surroundings as will surely entail upon them and their families the sufferings and sorrows of sickness and a deeper poverty.

In the contest between the grinding landlord and the oppressed tenant, the battle is too much on one side, and fair play requires that an umpire should be appointed.

It is no injustice to the landlord that he should be obliged to

provide for his tenants houses which they can live in without danger to their lives, houses which it is possible and practicable to keep cleanly and wholesome.

It is not to be denied that in every large community there are those who are grossly ignorant, dissipated, and reckless, with no conception of orderly living and comfortable homes. But for this they are not wholly and solely responsible. The structurally defective condition of the dwellings in which they are compelled to live, enchains them in their degradation. There is a responsibility also resting upon those who can, and whose duty it is to, intercede for them and to stand between them and their oppressors.

In other cities much has been done in this direction with the happiest results. An able writer on this subject has said: "Would that social philosophy could bring the same amount of devotion and energy to check the causes of distress which benevolence brings to the relief of individual suffering.

"Far nobler and more practical than the sympathy which is only awakened by present and visible suffering—and when it has given temporal relief dismisses the painful subject—is that philanthropy which abolishes the pernicious agencies that depress the moral and physical welfare of the working classes, removes their temptations to evil, helps them to healthy, comfortable homes, and gives the means of physical and intellectual enjoyment."

If unrestrained by judicious laws and authoritative supervision, the inevitable tendency of the tenements of the poor, in cities, is to grow worse and worse. The fearful horrors of the tenement-houses for the very poor, in the old and large cities both in this country and Europe, are such as we have no conception of, as yet, in New Haven. But there has been no effective barriers erected here, to prevent the steady progress and growth of tenement-house evils, as our city grows, as the poor multiply, and as poverty deepens and intensifies. So that as time goes on, New Haven must necessarily repeat the experience and suffer the same unhappy results as these older and larger cities, unless some timely precautions are taken to prevent them.

There can be no circumstances under which the old adage is more appropriate, viz.: "An ounce of prevention is worth pounds of cure," than in the matter of tenement-houses in a growing city. I would therefore most urgently suggest that your Board move the Court of Common Council to appoint a committee to consider and

report what further legislation is necessary to protect the health and welfare of the residents in tenement-houses.

HOG-PENS.

Another matter of sanitary importance I think calls for your attention. New Haven stands almost, if not quite, alone among cities of its size, in the toleration of hog-pens. It is conceded by all who have given the subject attention, that they are more than a disagreeable nuisance; they are positively unwholesome, and promoters, if not producers, of disease. In the City of Providence, during the prevalence of Asiatic Cholera in 1854, Dr. Snow, the eminent Superintendent of Health in that city, in a report to the Common Council stated, that after investigation "He was satisfied, and he believed the city government and the people generally were satisfied, that the keeping of hogs was one of the principal causes of the disease in certain localities."

Your reporter very well remembers that during the same year, among the few cases that occurred in New Haven, one was in close proximity to a very filthy hog-pen in the Eastern side of the city, and it was the opinion at that time of "The New Haven Medical Association," to whom the facts were fully reported, that the hog-pen was a factor in the cause of the disease.

Besides the sanitary aspects of the subject, other serious evils are connected with the keeping of hogs in the city. Very few of those who do keep them have any means of doing it except by begging or stealing swill. And the character of those so engaged does not conflict with the suspicion that they would not neglect the opportunities so afforded to steal other things. Our streets too, would be relieved, if hog-pens were abolished, of those wonderfully dilapidated old vehicles filled with disgusting swill-barrels, the motive power of which are superanuated, starved, and crippled horses. The city has made provision for the collection and removal of garbage in a systematic and orderly way, and the public would like to be rid of the incursions on their premises, of these enterprising private swill-gatherers.

An ordinance should be passed, in the opinion of the Health officer, to the effect, that hogs may not be kept within the city limits without a license from the Board of Health, and that no license shall be granted to keep swine within a hundred yards of the residence of any other person than the one to whom the license is granted.

PRIVY VAULTS AND CESSPOOLS.

These abominations have already been spoken of in this report, and they have been discussed to some extent in every previous report. It remains, therefore, only to summarize as briefly as possible, the reasons why they are dangerous to health.

Their contents are mostly organic matter, subject to putrifying changes by which noxious gases are generated. It is also believed that in these masses of filth the germs of disease find the most favorable conditions for their reproduction and perpetuation. These facts being conceded, the danger arises in the following manner.

When filth-pits are not water tight, their liquid and gaseous elements percolate into the surrounding soil. The former descend and mingle with the ground-water, the latter occupies the interstices of the ground above, or evaporates into the open air. The point to note is this: These filth-pits do not *retain* what is put in them, but become active distributing reservoirs of liquids and gases charged with poisonous elements.

Now let us consider how the distribution is made. Constant motion is a law of the universe. Nothing is at rest, neither in the heavens above nor in the earth beneath; nor in the water under the earth; everything is moving. The ground-water of which I have spoken, and from which our wells are supplied, is a broad running stream, and in currents flow whatever its waters may hold in solution. Thus it happens that the disease germs, in the dejections from a typhoid fever patient, heedlessly thrown into a leaking privy vault, may be carried by the underground water-currents to infect wells at distances, the limits of which are not known.

In like manner the wind blows underground as surely, if not as rapidly as above the surface. Air currents in the soil are in constant motion in whatever direction the subterranean forces may propel them. They too, may be charged with the gases formed by the decomposition of whatever the soil may contain.

When, as now, vegetation is suspended, and the frozen ground seals these gases beneath its surface, they pass on to find escape in the unfrozen surfaces of house cellars. And through them to the house air above, with such effects upon the health of those who breathe them, as their quality may determine.

A privy vault and a cess-pool on a fifty feet city lot exert a bane-

ful influence, not only upon the owners but upon their neighbors on every side for an indefinite space.

Therefore, the Health Officer would earnestly recommend that such legal enactments be made as will forbid the construction of any more of them upon the line of sewered streets.

SEWER CONNECTIONS.

There is one other subject, the importance of which to the safety of the public health, your reporter is so much impressed with, that although he has urged it upon your attention in previous reports, he will venture again to mention it, still hoping that by frequent repetition, you may be moved to take some action, looking to an official supervision of sewer connections with dwellings.

The imperfect and defective methods so generally prevalent, and still practiced, especially for the cheaper houses built to rent, are not only sources of danger to the inmates of such houses, but have brought into disrepute all modes of connection, and created so strong a prejudice in the minds of some, as to deter them from making use at all of the public sewers. The Health Officer, at the risk of seeming importunity, begs leave to press upon your attention the urgent need that such effective legislation be procured, as will secure the registration of every master and journeyman plumber carrying on his trade in this city, and the official supervision of the plumbing and drainage of all buildings hereafter erected within the city limits.

I conclude this portion of my report with these four recommendations, viz.:

1st. The prohibition of new filth-pits on the line of sewered streets.

2d. The better protection of the tenements in tenement-houses.

3d. The abolition of hog-pens; and

4th. The official supervision of plumbing and drainage of all buildings hereafter erected.

EXTRACTS FROM THE REPORTS

OF

Boards of Health and Health Officers.

REPORTS OF CITY HEALTH BOARDS.

The number of cities that receive as regular and complete returns from their Board of Health is not large. In fact New Haven is the only one that has a full and complete report. The capitol city—Hartford—receives at present no report from their Health Board; the abstract of vital statistics from the registrar is printed with the reports from the various departments. The city in fact does not encourage them to do so. It gives them no office, leaves the subject of regular sessions discreetly done, and asks no report, nor even that a record of proceedings be kept. When the re-organization of the board is effected let us hope that this reproach will be wiped out, and the claims of the health interests of the city to receive systematic treatment, and intelligent discussion recognized. As it is, all the legislators of the city have to direct or guide them in forming an opinion upon many questions that affect health and life, is the opinions of such physicians as they may consult, which will not take the place of facts however excellent the opinions are.

Although the methods in many instances might be improved, yet much good work is done. Extracts are given from such reports as are available. The discussion of the sewerage of Waterbury includes a discussion of its sanitary relations.

MERIDEN.

There has been no epidemic in our city the past year, and no unusual amount of sickness, except perhaps in the early part of the year, when there was more or less of scarlet fever among children, which resulted fatally in several cases, but owing to precautions taken by the committee to prevent the spread of the disease, it was confined to narrow limits.

Your committee would recommend that some action be taken, as soon as practicable, towards the drainage of certain sections of

the city where the soil is so springy or rocky that it will not absorb the filthy water from sinks, which must therefore be allowed to remain upon the surface of the ground, thereby endangering the health of the citizens in the immediate vicinity. The committee have received several complaints from this source the past year, but have been powerless to remedy the evil under existing circumstances.

Your committee will also recommend that some immediate action be taken whereby the filth of the city shall be removed by the process employed by the Meriden Disinfectant Company, whereby all offensive odor is overcome while the same is being removed, thereby admitting of the work being done in the day-time, when the parties directly interested may be able to watch the same, thus ensuring a more perfect and satisfactory job being done.

The committee were in hopes to be able to report this year that the greatest nuisance of the city, known as Andrews' Dam, had been removed, but in this we are disappointed, and can only say that the matter is in the Courts, and we trust that a decision favorable to the city will be made at an early day, whereby this immense cess-pool may be removed, thereby creating an unobstructed outlet for the filth which may accumulate in the stream known as Harbor Brook. For the amount of expenditures of this department we refer you to the report of the Finance Committee.

NEW BRITAIN.

In making the annual report, the Health Committee respectfully congratulate your honorable body on a general improvement of the sanitary condition of the city. The whole number of deaths during the year 1882 has been 328 (three hundred and twenty-eight), an increase of 88 (eighty-eight) over the previous year. The increase may be accounted for in the increase of population and the prevalence of scarlet fever and diphtheria. In 1881 there were no deaths from scarlet fever and only *four* deaths from diphtheria. In 1882 there was twenty-eight deaths from scarlet fever and eight from diphtheria. There was also an increase of twenty-four deaths from cholera infantum during 1882.

No general epidemic has prevailed, and no large amount of sickness has been confined to any particular locality. In November and December scarlet fever and diphtheria appeared in different parts of the city, and at one time seemed to threaten a general

epidemic. The attendance in the public schools was materially diminished, and in some instances the schools would have been discontinued except for the prompt action of your honorable body, in passing such ordinances in regard to contagion and malignant diseases, as enabled the committee to exclude from the schools all children liable to communicate scarlet fever. With very few exceptions, there is no reason to believe that these diseases were induced by local causes. The winter set in early, about the middle of November, and ice that formed at that early period has remained till past the middle of March. So long a period of uniform cold has rarely occurred in our climate.

As might be expected, diseases of the respiratory organs have been more frequent than usual. Colds and influenza have been generally prevalent, with a larger number of cases of pneumonia, especially of a typhoid type, than usual. The proportion of deaths from scarlet fever has been unusually large, owing, no doubt to the persistent continuance of cold weather.

The causes leading to malarial fever have largely decreased. Very few new cases of chills and fever have come to our knowledge. One family has been afflicted with chills and fever apparently from a local cause, and the committee has insisted on measures calculated to remove the cause. The general type of disease has continued to be modified by the malarial influences of previous years. *Seven* cases of death from typho-malarial fever have been reported, and only *one* case from typhoid fever. Typhoid symptoms in pneumonia and other diseases are becoming more common than when a stronger malarial diathesis prevailed, and we have reason to believe that by proper sanitary measures, we may soon entirely be rid of chills and fever or malaria in its primary form.

Your committee has been obliged to spend a large amount of time in securing compliance with the city ordinances in regard to privies, sink-drains, and hog-pens. Some 250 notices have been served on different parties. We have not made a single prosecution during the year, though in several instances we have taken measures to bring suits, when the parties made haste to comply with our orders. It is very doubtful whether a long continuance of such a pacific course will be either wise or possible. The board having been so lenient the last year, it is a question whether a more vigorous policy may not be necessary in the future. Violators of the city ordinances have no right to expect the committee to make

annual visits to remonstrate against the violations of laws that are so well known.

We congratulate your honorable body on the completion of several new lines of sewers, which will materially contribute to the sanitary condition of the city. The largest number of deaths during the year has been in streets where there have been no sewers, or only a portion of the street, as in Beaver Street, where the largest number of deaths is reported. There have been 180 deaths on streets not sewered; ninety-eight on streets partly sewered, and only twenty-three on streets fully provided with a sewer.

The general healthfulness of the sewered portions of the city as compared with the other portions, furnishes the strongest argument we can offer for an extension of the system to every street in the city. North, Broad, Sexton, Clark, Hart, and Lincoln Streets imperatively demand sewers. When we consider the advantages now apparent from existing sewers there is no built-up street that can afford to do without one.

We beg leave to again call your attention to the fact that, so far as our knowledge extends, the construction of service sewer pipes in dwellings is under no special supervision. Each plumber or each proprietor is allowed to put in the sewer pipes according to his own fancy or judgment. Thus far we have no knowledge of any evil effects from sewer gas. But all our existing sewers are supplied with water so freely from springs or from the old brook, and from a free use of Shuttle Meadow water, that all the gases are so rapidly absorbed as not to be likely to be pernicious. But we are liable to construct other sewers where there will be less water, and an excess of gas that will escape into dwellings not properly trapped.

Congratulating your honorable body on the health of the city the last year, and hoping that our city may become as remarkable for its healthful condition as for its enterprise, we respectfully submit the foregoing report.

B. N. COMINGS, *Chairman.*

NEW LONDON.

We would commend to the thoughtful consideration of this Court of Common Council the adoption of some approved system of sewerage, so that permission may be granted to private parties to construct sewers in accordance with such plans, so that when the city adopts a plan of sewerage the sewers already laid may be

utilized. Such a system would be the means of inducing many persons to adopt sewerage who now put up with poorly constructed privy vaults and cesspools. Nearly all these vaults are simply stone walled, not cemented, so that the contents filter through until the soil becomes saturated. This, in a city whose limits are the smallest in area in the State, if not in the nation, with four-fifths of the population in the northern fourth—nine thousand (9,000) in one square mile—crowds the dwellings too close to these imperfect receptacles.

We would also call your attention to the recommendation of the Health Committee of 1882, "for the establishment of a marine hospital, so that disease brought here on vessels may be properly taken care of without subjecting the city to the risk of infection by having disease brought into or through it."

From Inspector Burke's Report.

I would call your attention to the many premises within the city limits where sewage is allowed to run into the streets, and this is done in direct violation of our By-Laws and Ordinances—Section 6—which distinctly states that no person shall place or keep any drain which discharges into or upon any street. Section 30 of the Charter expressly says that this is an offense punishable by fine.

Another matter I would call to your attention. This is the pernicious habit some people have of uniting the privy matter with sink water. I found upon examination that many dwellings in the city with bath tubs, water-closets, and sinks have but one vault to receive all. It is true that some of these vaults are covered and the pipes leading to them are trapped and ventilated, but there are others that are not so well fixed. And when one of these open vaults is found we find an annoyance for an entire neighborhood. The most noisome stench arises from union of privy matter with sink water. In a few cases I found that, in addition to the sink water, the owners of dwelling-houses allowed the surface water to find lodgment there also, and when a rainfall occurs the water from the roof, conducted by pipes to the vault, and falling there with force, the effect can be imagined. Such a union creates a stench, the like of which cannot be manufactured. A law ought to be passed prohibiting such union.

In compliance with orders received from you, your Inspector made an examination of the school-houses and their surroundings,

frequent complaints having been made of the stench which, at times, impregnates the air of the school rooms, making teachers and children sick. And in this respect I would state that I know where children came home complaining of the stench in and around the school-house. I found in all the school-house yards privies from which came more or less stench. Two large vaults, covered with houses; no covers to the seats; foul gases are constantly arising from them, the contents of the vaults being constantly agitated; troughs used as urinals emptying into them, keeping the matter in the vaults wet. Children at recess habitually play around these vaults, unconscious of the danger that surrounds them. And when occasion requires them to use these places, they are met when entering the privy house with this terrible stench. This state of things is bad enough, but when we take into consideration the fact that the school-houses, in some cases, are surrounded with privy vaults, that are constantly emitting these foul gases, we will not be surprised if our children come home sick at times. Upon examination I found the school-house in one district surrounded with twelve (12) privies—exclusive of the two in school-house yard—all of them within one hundred (100) feet of the school-house—the contents of two of them leaching through and over the play grounds. In another case I found ten, including vaults in yard; in another six, and from this district the most complaints come. And the contents are being constantly agitated, from the fact that the tenants in dwellings pour slops of all kinds into them. This is a serious matter, gentlemen, and I hope you will give it some consideration, that some means may be devised whereby the lives of the little ones may be protected.

There are within the city, and the most thickly settled parts, two thousand five hundred (2,500) privies, sinks, and cesspools. Many of these are in bad condition, being improperly constructed; many of them open and the contents exposed, where, if it is not detrimental to health, it is at least very annoying. If an examination is made next year, I do suggest the propriety of these unsightly places receiving some attention.

I would call your attention, also, to another matter that I think of vital importance. At various times permission has been given to different parties to lay sewer pipes through the streets in their localities, and these pipes have been laid without any supervision on the part of the authorities. The evil arising from this neglecf

on the part of the city is now apparent, from the fact that in some of the lower portions of the city, where these pipes have been laid, sewage is forced back into the premises by the action of water when high tides occur. Complaint has been made by parties connected with sewers that their cellar floors were covered with sewage coming from dwellings higher up, who are connected with the same sewer, and when obstructions happen the people whose dwellings are on lower ground are taken at a disadvantage. The parties who originally laid the sewer, after having received the actual cost of laying the same, threw the responsibility of keeping the pipes clear upon the entire community, who are connected with the same, so that when trouble arises nobody is responsible. I think that if proper attention was given when these pipes were laid, in regard to grade, that this trouble would have been avoided. I consider many of the connections with the different sewers entirely wrong. The object of some people is to get rid of sewage without paying any attention to prevent sewer gas from entering their houses.

In conclusion, gentlemen, I take pleasure in saying that in conversation with several of our physicians, in regard to the health of the inhabitants of the city during the past year, all say that, contrasted with other years, we have been very fortunate in not having some form of epidemic to contend with. Open as our port is, and liable as we are to the introduction of disease from other places, I think we have been very fortunate.

DERBY.

The following from the report of Dr. Beardsley, of Derby, on the health of the town, with special report on the vital statistics, is interesting and instructive. The parts on which sanitary questions are treated are here reproduced:

The year 1883 presents some features in vital statistics alike interesting to the physician and the public. The unexampled growth and prosperity of our town within the last decade has given us a mixed population of at least fourteen thousand. This increase is much indebted to the influx of a class of people necessitated to occupy, with bad, imperfect, or no sewerage at all, dingy, ill-ventilated, unhealthy, crowded, and in many instances underground tenements, not fit to live in, all of which have been a fruitful source of disease and death, thus swelling to some degree the percentum of our mortality.

There has been no epidemic, except we mention malaria. It is a fact, and no theory can explain it away, that this atmospheric poison has developed and governed a variety of diseases and deaths, reported by different physicians under the head of intermittent fever, congestive chills, typhoid pneumonia, typho malaria, etc. Whatever lowers the standard of vitality in any individual, disturbing the healthy functions, invites an attack of active disease in some form, the weakest and most susceptible organs being generally invaded, while malaria is the predisposing cause. Cerebro spinal meningitis, so much dreaded and so fatal, in many instances is directly traceable to malarial chills. How much bad water, garden vaults, cesspools, want of proper sewerage, accumulated filth, foul gases, etc., intensify the fatality of our diseases, we will not stop to inquire; but when nearly a whole family has been swept out of existence with one and the same disease, and bad drainage is found to be the cause, it requires no stretch of the imagination to place the responsibility. The bitter lessons of experience are fast educating the public up to the great importance of a subject which will ultimately compel them, for their own safety, to apply every sanitary remedy for prevention within their reach. Scarlet fever and other contagious diseases have not been as prevalent as in previous years, or, if so, have not been remarkably fatal, wise precautions against their spread having been studiously kept in view. Diphtheria has been very fatal and still lingers among us. Consumption proper seems to be on the decline, only twenty-seven deaths from it having been reported, against thirty-seven in 1882. Cerebral affections are painfully on the increase, though we note only a few. In too many instances it may be seen that alcoholism is the primary or exciting cause, followed by extreme destitution, with gloomy forebodings of the future, driving the victims to madness and all sorts of dissipation, which too often terminate in murders, insanity, suicide, etc., with all their horrifying results. Another class, less prejudicial, is where more is attempted than can be performed, in a business or any other capacity, and the brain power is crowded or exhausted, at the expense of the physical forces, and the sufferer must flee to the mountain air or some fashionable resort for recuperation. But this is only temporary, and does not counterbalance the wholesome effects of the mental and corporal functions duly exercised, avoid-

ing *excesses of every kind* that may prove detrimental to the laws of health. This, in a word, is a text for longevity.

These suggestions, hastily thrown together, are sustained by actual and studied observation, the interchange of opinions among physicians, comparison of returns, etc., which are more reliable than subtle theories which seldom inaugurate needed remedies. Old diseases that formerly afflicted our community seem to be falling out of the list, and new ones taking their places, taxing the skill of the physician to his utmost capacity. Derby, however, will compare favorably with other towns of like population, in its percentum of mortality, and this should be a strong incentive to those who may wish location in a place so prosperous, and replete with so many desirable improvements.

THE DISTRICT SCHOOL-HOUSE.

BY

D. F. LINCOLN, M.D., Boston, Mass.

THE DISTRICT SCHOOL-HOUSE.

By D. F. Lincoln, M.D., Boston, Mass.

INTRODUCTION.

The purpose of this paper is to give some directions for planning and arranging small school buildings so as to promote the health of their inmates. Its chief aim is a practical one; the usefulness and comfort of the building, rather than the taste or elegance of its appearance, being taken for an object. Beauty is by no means unimportant, but can be discussed elsewhere and by others.

In building country school-houses not much money is apt to be wasted on mere externals. But now and then a district possesses the means, and the disposition, to build "the best that money can get;" and it is hoped that some of the advice here offered may help such communities to present examples of model buildings.

A model, indeed, which shall be suited to all cases, is not to be thought of. That which suits a warm, sheltered climate, is ill adapted to bleak, hilly spots. Materials, popular in one place, may be disliked elsewhere, and with reason. Different plans of instruction require different styles of building. If any universal model can be offered, it is that of the simple unit—the one-roomed school. And yet even this model is only a group of suggestions capable of various changes in every feature. Distinct plans, however, are given, and are explained sufficiently for practical purposes.

It is not thought best to complicate the subject by describing large buildings. The type of "country district schools" is well marked, and the line between them and city schools is distinct. The purposes of such a building are simple, and yet there are a good many matters in the planning of it which are apt to escape attention, unless insisted upon by some person who is specially impressed with their importance.

For convenience, the paper is divided into three parts: The first, describing some types of the district school-house as seen in our own State; the second, giving directions at some length, in a general way, for securing good sanitary results; and the third containing plans with descriptions.

I. VISITS TO DISTRICT SCHOOL-HOUSES.

At the beginning of our study of the subject, it was thought best that a few school-houses of the average type should be visited. Accordingly, visits were paid to eight buildings in the eastern part of the State, in the month of August, 1883.

This country abounds in hills and ridgy elevations composed of gravel and sand, and most of the school-houses stood upon rising ground of this sort. Some of the sites were bleak, but there was no other objection to be made to them.

The schools are of the ordinary district type; and the number of scholars in each does not vary far from twenty. None of the schools were in session. Two were of brick, five of wood, and one occupies the lower room of a wooden town hall. Three are about fifty years old; the rest were built within the past fifteen years.

Condition.—Nos. 1 and 2 seemed to be in good condition and repair. No. 3 is fully fifty years old, and ought to be replaced by a new house. The under-pinning is very shabby, the walls have cracked and settled, and bowed in several places, requiring wooden props; and some of the bricks are so soft that they can be crumbled between the fingers. The floors are much worn. No. 4 was like the preceding, and of about the same size. It has no cellar; the walls have bowed and settled badly; one window has been so twisted by the sinking as to leave spaces between sash and frame, above and below, through which I easily passed four fingers. The ceiling of Nos. 5 and 6 was falling off in large pieces. No. 8 was, in some respects, the worst off. It is an old wooden structure; at least forty years old. There is a porch at one side, with a part of the lathing ripped off. The main room is very low, and poorly lighted; the ceiling much broken, the stove cracked in several places, the stovepipe useless, the desks very badly hacked and carved. The floor, however, deserves honorable mention, being made of good, sound oak, evidently laid down when the

house was built, and is still in excellent condition, except where disfigured by the marks of chopping wood for fuel near the stove.

The last-mentioned house is the only one we entered that was strikingly deficient in light. Some of the others had windows badly placed — and this one is among the worst in that respect — but there seemed to be enough light in all the rest, while this seemed dark. By measurement of the amount of glass in the windows, it appeared that the ratio of glass to floor-space was only about one-twelfth. (Billings' requisition is, that the windows shall contain one-seventh of the floor-area.)

We will continue the subject by giving diagrams of the buildings.

It will be seen that the architects who planned these model temples of learning were guided by no particular principles. Nevertheless, there is evidence of progress, in some respects, from the older to the newer specimens. The oldest (3, 5, 8) are planned in disregard of the primary rule, "Never place windows in front of the scholars," while the newer buildings (1, 2, 6) have corrected this fault. No. 6, in particular, deserves mention as being well-lighted, having windows larger than usual, viz.: 30x56 inches, measured on the glass, which is to the floor-surface nearly as one-eighth.

The only school-houses that possessed shades were No. 6, which had the simplest possible curtains of white cotton (not rolling, but tacked up at the top), and No. 2, with some remains of old curtains. The only shutters were green venetian upon one of the buildings.

All the schools are warmed by wood-burning stoves, placed near the middle of the room, usually within four feet or less of some desk, and in no case provided with a screen. There is no ventilation whatever, except what is obtained by opening windows ; and this is done without inserting boards or guards to prevent the wind from striking the scholars. As a rule, the number that attend is not excessive, when compared with the cubic space ; but no doubt there is a constant struggle between the demon of the Black Hole and old Boreas for the mastery over these little, cracked, rattle-windowed, thin-walled rooms In summer, the windows are freely opened, but in winter the wind whistles freely through chinks in walls, around windows and doors, and through openings in the floor ; so that the question of fresh air is often thrown into the back-ground by the more pressing difficulty of keeping warm.

One house was said to be "always too warm in winter"; this one (4) was furred and plastered. Of one (3) it was remarked that it

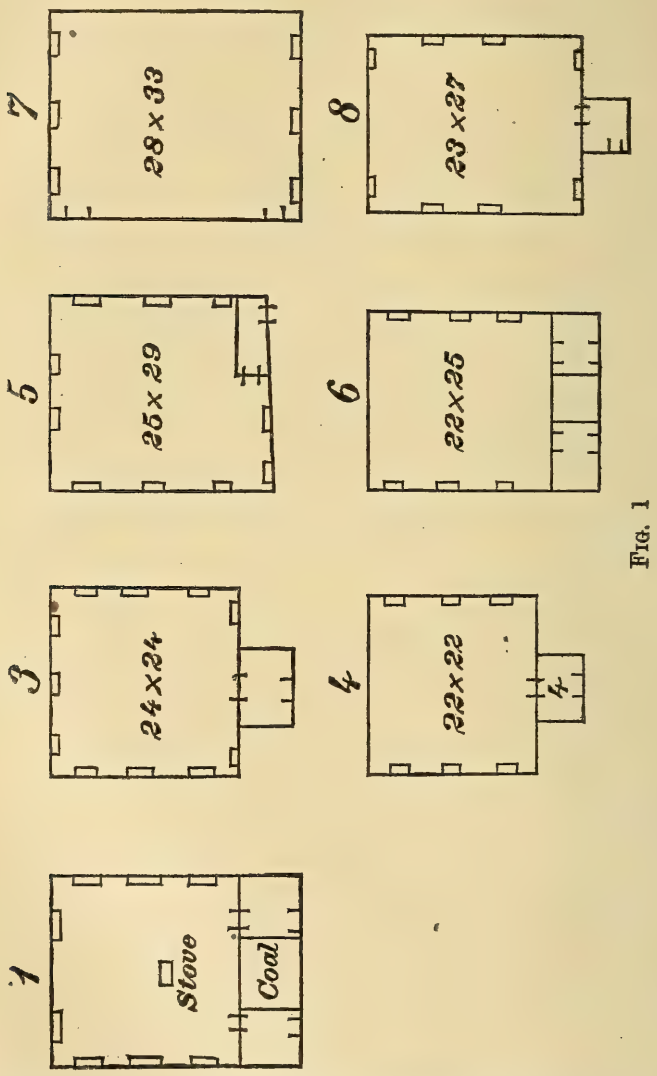


FIG. 1

had given our informant a headache every time he had visited it, or twelve times within the past three years.

In the ceiling of these buildings there are scuttles, leading to

the garrets. Such openings are commonly supposed to act as ventilators; but they are not at all to be depended on for this purpose, and often let cold air down into the room.

The rooms are nearly all too low-studded. The highest in the school-houses was nine feet seven inches. The one in the town hall, however, was high enough. No ceiling should be lower than ten feet; twelve is desirable; thirteen is the limit.

In one school an effort had been made to supply fresh air to a stove by a duct leading under the floor, but the experiment seems to have failed.

The capacity of the rooms was about as follows:

	Floor space.	Height.	Cubic contents.
No. 1,	535 sq. ft.	9 f. 4 in.	4,949
No. 2,	" "		
No. 3,	576 "	9 f. 7 in.	5,520
No. 4,	484 "		
No. 5,	791 "	8 f. 2 in.	6,427
No. 6,	550 "	9 f. 9 in.	5,362
No. 7,	924 "		
No. 8,	640 "	7 f. 2 in.	4,586

The allowance of cubic space ought not to be less than 200 cubic feet per scholar; and if the room is ten feet high (it should never be less) this will give twenty square feet of space for each occupant. Applying this test, we find that the largest room will accommodate nearly fifty; No. 5, about thirty-two; and the others from twenty-four to twenty-seven each. The condition of the schools is not, therefore, one of over-crowding, but might easily become such.

Let me supplement these formal statements with three brief sketches (from memoranda furnished by the Secretary of the Board) of school-houses which, as we think, furnish fairly typical examples of large classes of our country schools.

On a gravelly knoll, almost bare of vegetation, stands a little red school-house, with twelve windows, which in summer time display some broken panes, but are mended for winter. The little porch in front was intended, perhaps, to furnish two entrances; but at present it is so divided as to give but one, the rest of the space being taken for a wood-closet. In the entry there is a shelf, and on it a water-pail, which has to make a pilgrimage of nearly half a

mile to be filled. The school-room measures 23½ by 15¾ feet on the inside, and is 7½ feet high. The end by which we enter contains the door and one window; in a corner by the window stands the teacher's desk, and the rest of the width of the wall is occupied by a blackboard. The side walls are graced by a series of outline maps, some of them badly worn. A large box-stove stands in front, only three feet from the row of "recitation benches." Its pipe is carried overhead to the rear end, where a chimney, coming down to the level of the ceiling, receives it. The usual scuttle gives access to the garret.

The number of scholars in winter often amounts to forty-six, though in summer it is rather smaller. They are seated in two rows of seats, five seats in a row, with desks in front; and there is also a bench set up against one side wall for the smallest ones. On each side there are four windows, in the rear three, and in front one; none provided with blinds or curtains. Each window has seven rows of 5x9 glass, and the upper sash can be lowered seven inches. They are very loose. There is but one privy, which is near the road; the door is half broken from its hinges.

Obviously, here is little to be held up for imitation. If we seriously attempt to picture the scene in imagination, the result is somewhat as follows: There is a red hot stove right in front, with a row of scholars on seats which come within three feet of it. The hot pipe passes within two and a half feet of the heads of those behind. If we stand, we can almost touch the ceiling. If we sit, we are conscious of a torrid zone at the level of the head, a frigid zone at our feet, and an occasional small blizzard at other levels when a window is opened for momentary relief. The eyes are exposed to the glare of the sun and the snow. Accommodations are of the rudest sort in most respects. We need not call such a place "utterly unfit for human use"; there are much worse places; but we feel it a pity that it cannot be much better. In truth, the room contains only about one-fourth as much cubic space as it ought to contain, for the given number of children; it is defective in every dimension, especially in height; its atmosphere will begin to grow close within two minutes after the school opens; there is every provision for catching cold and getting headaches; and, beyond doubt, such a room is seriously dangerous to any person predisposed to consumption.

Still, something is done; windows are mended, for example.

But the effort to remedy such a condition is idle. Most of such buildings are not worth the expenditure of much money. A temporary strain upon the resources of the district, for building a new house, is the plan which will pay best in the end.

Here is another type: The school-house stands in the center of a lot forty feet square, fenced on three sides by a high stone wall. The out-houses occupy the two further corners, and a screen runs from the school-house back to the wall, between them. The house itself has two doors, and the school-room is of twice the cubic capacity of the one just described. (Floor $30\frac{1}{2}$x$17\frac{1}{2}$, height 9 feet.) The windows are larger; there are five on each side, and three at the back. Water is obtained at a neighbor's, a few rods distant. All this is well. The arrangement of the seats is rather eccentric, however. In the front of the room a free space of ten feet is left. The remainder, comprising a space of about 17 by 20 feet, has four rows of seats, rising by successive steps one behind the other, with their backs toward the three walls, and facing the center of the space, where a stove is put. This arrangement, however well adapted for promoting sociability, has been planned in entire disregard of the requirements of good lighting. Most of the scholars, in fact, are placed with five windows right in front of them.

Let us take still another example. This time it shall be a fair specimen of the better class of village schools; an object of pride and care, an ornament to the landscape, and a model of the best ideas of its builders.

On a village green, not far from the church, stands the school-house, neatly kept, painted white, with green Venetian blinds outside and neat green shades inside. There are two doors and an entry to each. The desks are modern; there are maps and globes, and a fair school library. What fault can be found with this?

Let us see. In the first place, there are the privies, within a few feet of the rear of the house; they are of the old-fashioned sort. They probably become offensive at sundry times, and during the severe cold weather it must be a trial to the fortitude of a delicate person to visit them. In schools like this many a child suffers from retention of the natural discharges; a suffering which is not momentary, but has permanent disease or disorder for its consequence, and which might easily be prevented if proper accommodations were provided. There is a well near by, in a good neighbor's kitchen; but the slops are thrown on the ground

just outside, and there is a stable, pig-pen, and privy combined, just across the yard. Who can guarantee the purity of the water?

Inside, the house is lighted by four windows, two on each side, which is an extraordinary case of neglect, as twice that number are usually put in. The room is quite low, being $8\frac{3}{4}$ feet stud. Some think a low room looks better shaped, and some say that it is easier to warm it; but, however that may be, the *minimum* height ought to be *ten* feet, and if advice is accepted from us, it will be more—say about twelve feet. The proportions inside are not good, being 37 by $19\frac{1}{2}$ feet. The room is too long, at any rate; and the width is only a foot more than half the length. If we compute the cubic capacity, we find that, allowing an attendance of 50 scholars (which is sometimes the case), the room gives a space of 126 cubic feet of air per scholar. We ought not to rest satisfied with this; if a new school were built it is to be hoped that twice this allowance of space would be granted. Two hundred and fifty cubic feet per head is desirable; from one hundred and eighty to two hundred (180–200) is considered a minimum for a wholesome building.

We further notice that there is no place, no means, for ventilation. The stove is an economical base-burner, which affects the state of the air very little except as a heater. There is no screen to guard its neighbors against excess of heat; a screen ought never to be dispensed with in such a stove.

This pretty school-house, in short, is low, over-crowded, overheated in some parts, unventilated, badly lighted, and exposed to a neighboring nuisance. Few are much better!

II. GENERAL DIRECTIONS.

Site.

Nothing inside of the house is likely to do more harm than certain surroundings may do. Low ground, frequently covered with mist, in the neighborhood of land that is sometimes overflowed, or ground near mill-ponds or marshes, or in damp valleys, is to be avoided, since it often breeds malaria or consumption. Dampness must be shunned at all events. A soil full of springs of water may prove an incurable trouble. Where puddles of rain water are seen standing for a long time after a shower the land is often damp. An elevated spot may be very damp; its dryness should not be taken for granted.

If the atmosphere can be looked upon as wholesome, and the dampness is entirely a matter of underground currents or springs, we may perhaps undertake to secure a dry spot by the methods of draining commonly practiced. It is not well to simply fill up a natural hollow, towards which the water is accustomed to flow, for the purpose of building on the spot; the stagnant pool is not dried up, but only concealed, by filling. When the bottom of a cellar is springy the cure is very difficult. Sometimes the water comes from the side; it may then be intercepted by digging trenches around the foundation, and filling them with loose material, as brush and stones, with earth on top; the water collected in the trenches must be led away by a drain to some lower point. After drainage has been secured, grading may perhaps be necessary in order to prevent surface water from entering.

The ground belonging to the school is rarely, in the country, ornamented with shrubbery. It will not, however, be out of place to suggest that a school-house, in the climate of New England, ought not to be much shaded. The sun is a very wholesome thing, and ought to come in as much as can be allowed, both summer and winter. A tree which stands in front, its boughs waving in the wind, often annoys the sense of sight very much by the flickering light it causes.

No school ought to be so placed as to expose its pupils to moral or physical danger from the neighborhood of railroads, or liquor-shops, or places of low resort. Noise is a great nuisance, and furnishes a reason for avoiding the neighborhood of factories.

The playground ought to be dry in ordinary weather, and should have if possible a southerly exposure. The house should face towards a sheltered quarter, if there be any such; the doors ought not to open in the direction whence storms commonly come, if there be such a direction. Very few houses are without some kind of vestibule with double door. It is well to arrange the doors so that the wind will not blow straight through when both are open at once.

Lighting.

This subject is connected with the preceding, because the shape of the lot or its position in relation to the road often seems to determine the way the school-house is placed. The comfort of the scholars, however, is affected when the house faces in a bad direction. The sun ought to enter freely into every occupied room at

all seasons. Few, if any, country schools can be found where that is not the case at some time in the day. But many are exposed to the nuisance of a westerly sun, which in the latter part of the day throws its rays horizontally, searching every corner, in spite of curtains or blinds. A southerly sun, on the other hand, is high, and its rays do not reach far into the room; it is best to invite its visits by causing the windows of one side to face due south.

A northern light is the purest and the best to work by. If one side of the house faces south the opposite side should also have windows for admitting this pure light. There may be times when comfort requires the exclusion of the southerly sun, and when the northern windows are needed. In summer, too, it is a great comfort to have a free draught sweeping through. Hence it is thought best, for schools of this class, to recommend that the windows shall be placed, not solely upon one side, as in the pattern schools of large cities, but on two, or even three sides. It is further ascertained to be a fact that a good deal of unconscious ventilation goes on through unnoticed cracks, even in well-made windows, and experience shows that the air is usually purer in rooms where the windows are on opposite sides, and less pure where only one side has windows. And this is the case, even in winter, in the coldest weather. Hence, where the means of artificial ventilation are so liable to be imperfect as is the case in country schools, it is well to try to insure some natural ventilation.

As a matter of course the pupils must not so sit as to face windows while at work. And we ought to extend the same remark to the teacher. There had better be no lights in either of the *ends* of the room, which we have proposed to light from its north and south *sides*. If the teacher sits at the eastern end, the scholars will face to the east, and the north light (always available) is on their left hand.

To a person writing, light from directly in front is trying and hurtful. If the window sill is very high, so that the light falls upon the face with considerable slant, the effect may be pleasant; but few windows are high enough to produce that effect, and, in general, front lights must not be used in schools. A light from the right or the rear is uncomfortable to write by, but is well enough for reading if the book is held properly.

Light coming horizontally is of little value compared with that from a high point; hence, windows ought to be made to reach as

near to the ceiling as convenient, certainly within a foot of it. They ought also to descend low enough to give the scholars the pleasure of looking out. It is good for the eyes to have occasional rests from close work and to look at distant things. There may be reasons for the contrary rule; it may be right to prevent their eyes from contemplating certain objects. For this purpose curtains that roll upon a cylinder fastened to the sill are excellent; they cover the lower part of the window, as much as may be needed for the time being, leaving the upper portion free. These curtains should be dark colored. They are also very grateful to the eye of a teacher who has to sit facing a window. They are pleasant in winter to shut out the glare of the snow. In fact, if but one kind of protection is used, this is on the whole the best.

Windows ought to open at top and bottom. They should work easily. The double window is a great protection against cold, but, as commonly applied, double windows are opposed to ventilation. It is common to make a single sash large enough to cover the window entirely; this is screwed on outside the ordinary window, at the beginning of cold weather, and seals it hermetically. The right arrangement consists of two complete pairs of sashes, each capable of being raised or lowered in the usual way. This plan not only gives sufficient protection against the weather, but at the same time affords excellent aid in ventilation. An ordinary window, when opened, is dangerous in cold weather. A double window, as here described, may be opened outside at the bottom, and inside at the top, for the width of an inch in cold weather, and several inches in medium or thawing weather. The stream of air thus entering will have to pass over a surface of glass, warmed by the school air, for a distance of several feet before entering the room. It thus enters partially warmed. Besides, it enters in an upward-slanting direction, so as not to strike upon the scholars at once.

Outside blinds shut out a great deal of light if painted of the ordinary dark green. A much lighter tint (but not a red or yellow) would be better for the eyes. They have the advantage of letting the wind pass through in summer.

It is not easy to find window shades, curtains, or guards of any sort that fulfill all demands. If too dark, they obstruct the light; if white, they dazzle. If cheap, they are good for little; if expensive, they are apt to have some patent "kink" which gets out of

order. Those above described as rolling from the bottom are pleasant to the eye, and can be so arranged as to exclude the sun in summer without excluding the wind. This can be done by tilting them inward about a foot at the top; a little ingenuity is needed, however, to secure them in that position. A white curtain is not recommended.

It is very well to seek for architectural effects by "treating" the windows. Arched tops, heavy mullions, small panes, stained glass, have their effect; even a dead window may be thought elegant. But all these matters must be kept strictly subordinate to the main objects of use and comfort. The pointed windows, and the other accessories of Gothic architecture, cut off much light, especially from the top, where it is most needed. Low windows are thought in good taste, in certain styles, but they are totally wrong for school uses. Heavy cornices, projecting roofs, piazzas, must not be allowed to shade the windows, in our climate, at least. The "Italian" awnings, which are so pretty and useful for private houses, are out of place in school buildings. They cut off light at the top, and on warm days they greatly impede the circulation of the upper layers of air.

A school-house ought to be recognizable by the abundant supply of windows it contains; square-topped and high—somewhat different from what we expect in dwelling-houses. The architect does well to group the windows with a view to effect, but he should always subordinate himself to the practical needs of the school.

There is a general rule for determining the amount of window-surface required; it should equal about one-sixth or one-seventh of the floor-surface of the room. A room measuring 24 by 34 feet (suitable for from 40 to 50 scholars) contains 816 square feet of floor, and should have about 125 square feet of glazed surface, which corresponds to seven or eight windows of the height of six or seven feet and two feet and a half across. Four on each side, carried up high, will be a suitable arrangement.

As it is unpleasant to face a light, the blackboards should be placed on walls that have no windows; for instance, behind the teacher. A good width is four feet, beginning at three feet from the floor and going up to seven feet. Slate is the best material. But a very good substitute is made by pasting strips of Manila paper, cut by the dealer to any width and length desired, against

the wall, and then coating with some preparation of liquid slating. The wall must be finished smoothly before papering, and the paper is then applied just as common house-paper is. The result is an excellent, durable surface, which can be renewed by fresh applications of slating. A specimen seen by me in Boston cost eight cents per square foot, complete. Liquid slating must not be applied directly to the plastering; the effect is often shabby and the surface is too smooth for work; it reflects the light, too, in an unpleasant way.

Desks.

Many of the old-fashioned plank desks and seats are of tolerably correct proportions. Some are very much out of the way. Not to dwell too long upon a subject which has been greatly debated, let us say that a desk-lid ought to overhang the corresponding seat by an inch or two, in order to prevent the pupil from leaning forward and crouching over his work. The feet must be well supported; if a seat is too high the child must have a foot-rest. The bottom of the seat must come forward to near the knees and must be curved to suit the shape. The back has a slant, which in American furniture is probably too great. The height of the desk should be such that when the pupil sits upright the arm sweeps over it freely in writing without being raised.

Ventilation and Heating.

Mention has been made of the way to make windows useful in ventilating the room. In large buildings, provided with systematic arrangements for bringing in quantities of warmed fresh air, and for removing impure air, windows may be restricted to one side of a room. But our single-roomed building is not likely to have such appliances. We must have windows on at least two sides of it to help at all times in "natural" ventilation. If a little money can be spared for double windows they will form an economical investment. But if the windows are single let them at least reach nearly to the ceiling, and let both sashes be movable. The ceiling ought to be high, say about twelve feet. It is very useful to place a strip of board, two or three inches wide and as long as the width of the window, beneath the lower sash, which is thus kept raised just far enough to make a small opening half-way up the window, between the two sashes. Air entering by this narrow slit passes

upward, mixing with the air of the room, and is hardly noticed by those sitting at the desks. This plan costs practically nothing and is recommended for all cases where ventilation is insufficient. Of itself it does not afford an adequate supply of fresh air, but it helps a good deal. We should expect much more air to enter when there is an open fireplace, with a fire, than when an "air-tight" anti-ventilating stove is used.

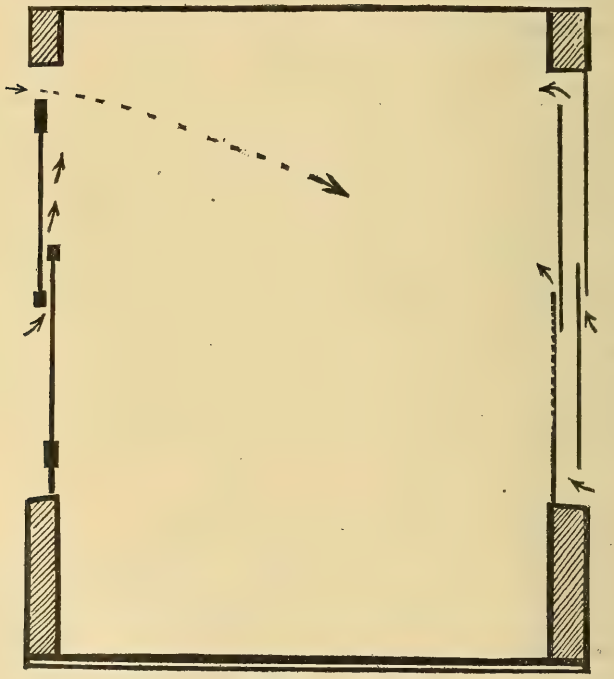


Fig. 2.

Figure 2 is a diagram of two windows seen in section, partly open for ventilation. On the right is a double window, with lower outside sash raised, and upper inside sash lowered. On the left is a single window; the lower sash raised, and the space below it filled with a board; the upper sash lowered. Air enters *between* the sashes, in a thin layer, maintaining for some distance a nearly perpendicular course. Air entering *above* the upper sash usually falls, more or less quickly, to the floor, somewhat in the direction of the dotted line. No relation is meant to be shown between the window to the right and that to the left.

If the heater is not powerful enough for the room there is no sense in ventilating. Warmth is the first requisite after all. In a room with the thermometer at 60° Fahrenheit we cannot open windows a great deal. Yet even then opportunities may be taken at recess-time, and a slight intermission, with calisthenics, may be given once an hour, during which it will be safe to freshen the air a little.

The tops of windows may be lowered in case it is found that no scholar feels the draught. A draught ought never to strike the person in cold weather.

Doors opening into halls ought to have transom windows, as a rule, but if they open into little vestibules full of clothes the matter is unimportant. A fixture for tilting the transom, composed of a sliding copper rod, is very convenient; in fact, unless the window can be easily moved and fixed in position it is of no practical use.

An old-fashioned fireplace with a fire in it gives considerable ventilation; in general, we may say that it ventilates sufficiently for the needs of ten or twelve persons, and is a decided benefit to the air when the number is four times as great. It is a cheerful thing, too, but has its disadvantages in practice. The floors are apt to be cold—and why? Because for every foot of air going up the flue a corresponding amount of cold air must come in through cracks and under doors, and this cold air at once seeks the floor. A room of the size above mentioned will probably be emptied of its air once in half an hour by a common open fire. But the air that goes up chimney is chiefly the lower stratum of colder air which has recently entered the room. The currents that set towards the hearth may easily be seen by placing a short candle in different positions. There is always a current *towards* the fire, and also a current *from* each window at the floor.

How can we prevent this chilling of the lower stratum of air? The answer is simple—by bringing into the room a sufficient quantity of warmed fresh air, so that cold fresh air may not be sucked in. Practically, this is not hard to accomplish. If there is a cellar the furnace throws up a good deal of air. If the heater is in the room a little contrivance will enable us to bring in a large amount of outside air in such a way as to warm it before entering. A plan for doing this is given here :

The stove must be encircled with a cylinder of sheet metal, leaving a space of some inches between it and the stove. This screen is set on the floor and secured there. A door is cut in it to get at the stove, but is usually kept shut. A hole in the floor under the stove is fitted with a pipe of wood or sheet-iron, which leads through the underpinning to the outer air. There should be a valve at A, worked by a rod with the handle at B. A wire screen is fastened over the outlet. Thus arranged, a common stove is converted into a portable furnace; a constant current of warm air may be felt rising from the space around the stove.

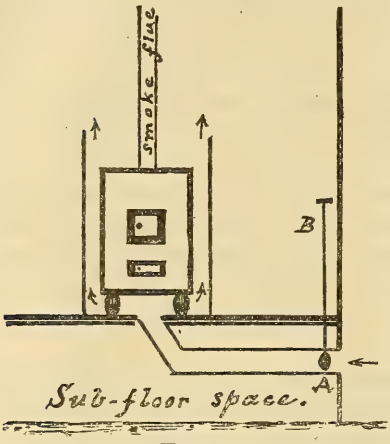


FIG. 3.

The screen described is sufficient for protecting the children from excessive heat. No stove should be without a screen, unless it be of some very slow-burning pattern, which one may almost lean against.

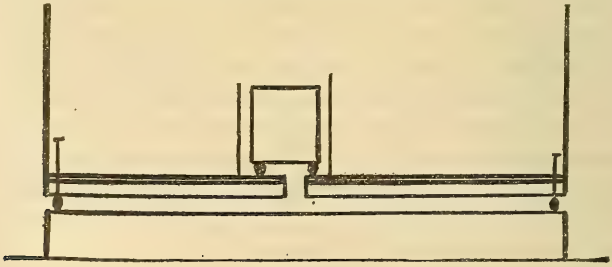


FIG. 4.

If the wind is in one direction, it forces the air in with violence, and the valve is necessary. But if it blows the other way, we may find that the air is actually drawing out, instead of in. To remedy this case, the following contrivance may be adopted.

Here there are two valves, respectively at A and B, either of which may be used according to the state of the wind.

The warm air thus provided will rise at once to a considerable

height, and will not be sucked in by the draught of a common stove. A small portion, it is true, will be intercepted by the draught before it gets into the room; but the draught of most of our closed iron stoves is very small. An open stove is a different matter, and ought not to be used in this plan without special adaptation.

It is to be presumed that there are no sources of foul air in the neighborhood of the inlets. By a look at the plan of a school-house, given further on in Part III, it will be seen that the school privies are situated near the corners of the school-room in which the stoves will naturally be placed. The fresh-air-pipe will naturally run straight to the wall and its outer end will be within ten or twelve feet of a privy-receptacle. Daily attention to the state of the latter will enable us to keep it free from offense; if this care be neglected, the whole arrangement will become a nuisance.

There is another kind of contrivance, in connection with chimney-grates, that deserves mention here. It is commonly called the ventilating grate, and several varieties have been made in our country. In this plan there is a reservoir for air in the rear of the fire, either built of brick, or ready-made of cast-iron in connection with some form of grate. This reservoir takes in air from out-doors, and passes it, warmed, into the room in large quantities. Careful experiments have shown that such an arrangement gives us several times as much heat from a given amount of fuel as the ordinary open grate does. Indeed, the common grate is an extremely wasteful kind of heater.

There are also stoves with open fires, which require no special setting into the chimney, but supply heated air upon the same general principle that we are explaining. The popular "Fire on the Hearth" is one such.

Success in ventilating a room has much to do with its size. There are many rooms so low and small that it is almost impossible to introduce a gentle current of air without its striking some of the occupants in an unpleasant way. High-studded rooms are easier to air than low-studded ones.

It is not necessary to give much theory here. It is thought desirable, however, by the best authorities in England and America, to allow a supply of fresh air, for each inmate of a *hospital*, equal to one cubic foot per second; in *theatres* and *halls of legislation*, one

half that amount, or thirty feet per minute. Suppose we adopt the latter estimate. The room which we have described, measuring 24x34x12 feet, contains 9,792 cubic feet of air, which is a proper supply for one person for 6½ hours, or for forty persons 8⅔ minutes. It follows that, even in this liberally-sized room, it is necessary to change the entire air at once in 8⅔ minutes, or seven times per hour, if we wish for perfect ventilation!

But perfect ventilation is not likely to be attained. I have indicated two of the chief methods of helping it—that by opening windows at the middle, and that by air introduced close to a stove. The amount entering by each method is very variable; but both together will not usually suffice. In fact we have hitherto omitted to speak of methods of removing air from the room—which is surely as important as bringing it in. If there is an open fire, a great deal is done already in this direction. If not, some provision must be made for withdrawing air by heated pipes or flues. The stove-pipe must be made useful in heating a certain special flue, the sole purpose of which is the ventilation of the room. There is no difficulty, and very little expense, in doing this. It may be contrived as shown in the figures.

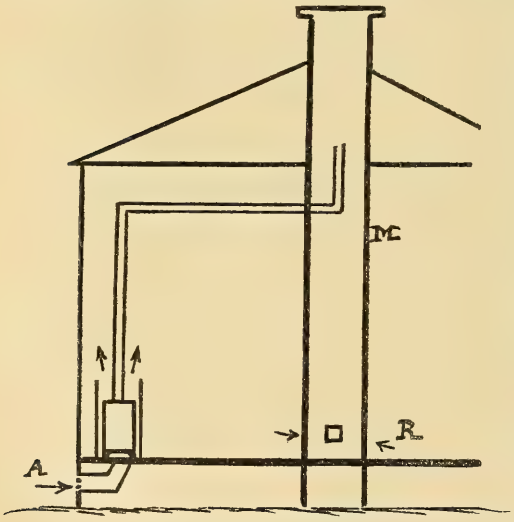


Fig. 5.

In figure 5 the air, entering at A, is distributed upward as seen by the arrows. It should not be allowed to leave the room by a high register, above M, as is often done, because too much heat is thus lost. A low register in the chimney at R (or even higher, if necessary to secure draught) will remove the lower and colder parts of the air, and "draw down" the upper heated parts to the level of

the floor. This helps greatly in remedying the trouble with cold feet.

The opening R must be considerably below the level M, at which the pipe enters the chimney, in order to prevent smoke from escaping into the room.

It is practicable to introduce this plan almost everywhere. There are many chimneys which could be used at once in this way, if a hole were cut through the masonry at R. This hole must be covered while the fire is starting. If the chimney comes down only to M, a pipe can be brought down toward the floor, and left with its lower end open. Another way is shown in Fig. 6, which is more effective than either of these, as it utilizes a great deal of heat from the smoke-pipe for increasing the draught.

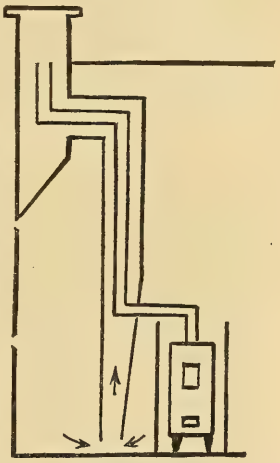


Fig. 6.

I have spoken of a stove—as if one stove were sufficient. For a room of the size mentioned, however, and exposed on half its surface to strong winds, it is not unlikely that two stoves will be necessary. They will warm the room more equally, and should be put at remote parts of the room.

How can we be sure that air will not come down flues, instead of going up as desired? First, the flues must be warmed; if this is not done, there may be trouble. Second, a cap should be put over them, of some pattern suited to prevent the wind from descending. Third, inasmuch as air will not pass up these pipes unless there is air to pass, it is advisable to have a constant free supply of warmed air *coming into* the school-room; the way to procure the supply has been stated.

It is not worth while to place dependence upon any cap, cowl, or hood for the purpose of *increasing* the discharge of air from a ventilator. The safe thing to rely upon is the ascensional force of warm air in a flue—and not the "action of the wind upon the beveled deflecting plates, whereby a vacuum is created, and a suctional influence ——," etc., etc., etc.

Water.

A supply of good water within a reasonable distance is essential in the site of a school. For procuring water in the school a driven well is often useful. In no case should there be a cess-pool, or an old-fashioned privy, or a muck-yard, or any similar thing, within one hundred feet of it. Even at much greater distances the slope of land or the natural seams of rocks will sometimes carry quantities of foul matter to a well, imparting to it, not the nasty smell one would expect, but a deceptive appearance of clearness and brilliancy.

Cisterns are to be made of masonry lined with cement, not of metal. The use of lead pipe to pump water from wells or cisterns is unsafe. At least, every portion of pipe that can come in contact with the standing water should be of tin.

Have a cover for the pail and a nail for the dipper.

Cleanliness.

The outer clothes had better be hung in a separate apartment. It will not be easy to arrange for warming such rooms in little schools. Their place is at or near the entrance; there should be one for each sex, with room for the clothes to hang apart.

Umbrella-racks, mats, and scrapers, need not be forgotten. No school need be without wash-basin, soap and towel.

It is generally necessary to sweep daily after school. Too often the thing is done carelessly, with windows closed, and dusting is neglected or done at the wrong time. This neglect tends to increase the impurity of the school air.

If there is a cellar it should be kept scrupulously clean; no heaps of dust allowed, nothing that causes ill smells. Cleanliness in the cellar is as important as in the school-room.

The school should be thoroughly aired by opening windows at the close of every session ; also after and during every sweeping. The floor ought to be washed once a week, usually.

Privies.

This subject is certainly important. The state of the so-called "accommodations" in many country schools is a disgrace to civilization and Christianity. They are a peculiar kind of Sunday-school, open all the week for instruction in morals, and the lessons taught in them are vividly remembered.

Presuming that the reader is agreed with me as to the need of improvement, let me offer a few suggestions upon this really troublesome problem:

If there is a constant supply of water and a good system of sewerage, water-closets may be used; otherwise not. They must not be of the pan variety if we can help it. If hoppers, they must give a quick, abundant flushing, not a prolonged dribble. It will, however, be hard to keep them from freezing.

Every such closet or privy should be cut off in some way from the house. They may be under the same roof, perhaps, but some passage or room well aired should come between them and other occupied rooms. They must be well lighted and so simple in plan as to be easily inspected. Well warmed, they hardly can be; but well built, and free from dangerous draughts, they should always be. It is best to arrange them like the modern closets in large hotels; separate stalls, each provided with a light spring-door that does not conceal the feet.

It hardly needs to be said that the two sexes ought to have entirely separate accommodations, out of sight and hearing of each other. There are schools where both are provided for under one roof, with a very slight partition; there are others where there is only one closet. In such cases the girls should have their recess at a different time from the boys. The buildings, if disconnected with the house, should be where the teacher's eye can easily reach them.

Many teachers are young ladies; and it seems hard to class supervision of these places among their professional duties. Some neighboring farmer or supervisor, or committee-man, should take it on himself to visit frequently and see that things are in order. The children should understand that it is discreditable to the school to have an out-house which resembles a neglected hog-stye. There are but few who will wantonly deface or injure property if they understand that it is in their keeping.

The matter of chief importance in preventing a nuisance is *frequent care*. Unless there is some one who can come daily, to give a thorough washing, the boys' privy should stand at a distance from the house. The case is different with the girls' cabinet, which is rarely found in an offensive condition from misuse. There are reasons why it should be so placed that those using it shall not have to pass out of doors. If the privies are already

built, away from the house, a path, asphalted, paved, or graveled, or made with cinders, should lead to them.

A cess-pool had better be avoided altogether. There are several plans which may be adopted for using that best of disinfectants—dry earth—either in an out-house or in a closet attached to the school building.

1. The dry-earth closet, in the form of a portable box, can easily be procured, and is suitable for use in the house by careful children.

2. The seats may be built over a brick vault, paved and lined with coal-tar; the vault is part of a cellar, and the care-taker goes into the cellar every day and shovels a thin layer of earth on. Although this plan has been known to work without any offense for some years, it is doubtful whether it can be generally advised. Removal weekly.

3. The receptacle may be a shallow convex trough of masonry lined with cement, frequently emptied (at least once a week) and sprinkled with earth daily.

4. Instead of this an iron pan may be used, long enough to provide for several seats, and with a ring at one end, by which it can be drawn out and hauled to the field or place where it is emptied. These two plans are applicable to closets in any situation. The pan, however, may give trouble by freezing on to the objects it touches, and No. 3 is the plan here preferred.

A shed or receptacle must be provided for the earth, which has little disinfectant value if used wet.

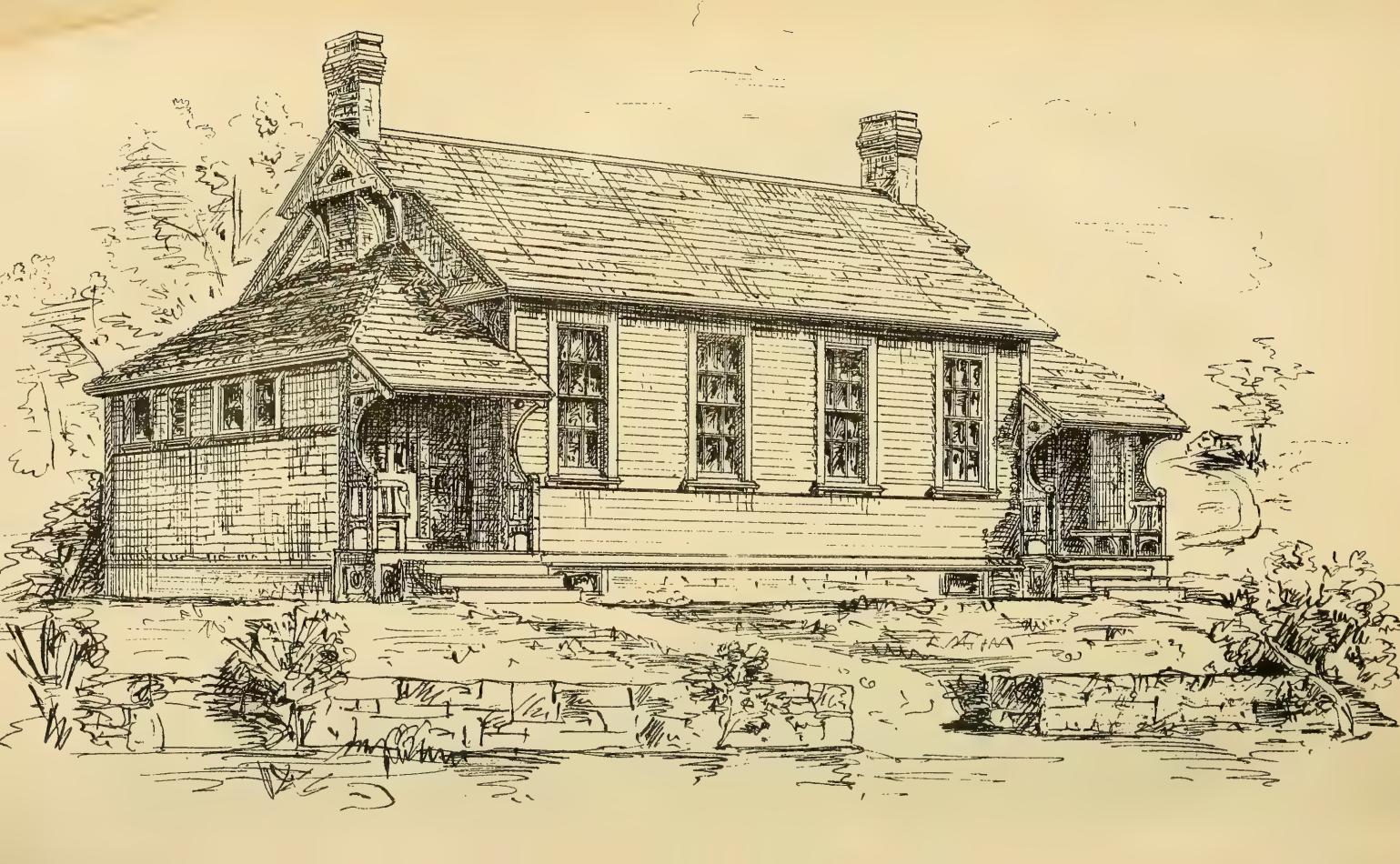
III. PLANS OF MODEL SCHOOL-HOUSE.

In the perspective view, taken from the street in front of the proposed school-house, several things meet the eye at a glance.*

The house is elevated four feet from the ground. The small windows beneath it may open either into a shallow sub-floor space, or into a cellar. This part should be secured against the entrance of animals; but there should be openings or windows to insure sub-floor ventilation.

The entrances for boys and for girls are separate. They are in sheltered angles, and are further protected by porches. There are seats in the porches.

*For the execution and artistic detail of this view, I am indebted to the skillful hand of Mr. Ernest N. Boyden of Boston, architect.



53.'0"
Privies 7'x7.6
Air Space 1.6'
1.6'
Sink
Entry
Seat
Porch
School Room 34'x24.'
Platform
C.
Shelves.
C.
Air Space
Privies 7.'x 5.'
1.6'
Fuel. 8.6 x 8.6
Entry 8.6x5
Porch
Seat
Girls' Entrance.
Plan
Boys' Entrance.

Fig. 8.

The roofs are arranged simply: there is necessarily a wing at each end, and each wing requires a separate roof. The porches are covered with continuations of the wing roofs.

The windows of the school-room are drawn six by three feet in size, which, with four windows on a side, gives sufficient opening. It may be remarked that they stop at two feet from the ceiling. For so small a room, with windows on two sides, this deviation from the directions elsewhere given (to place window-heads close to the ceilings) is excusable, though it was not the original intention to have it thus. There is, in fact, a special reason for not carrying the tops higher, namely, the projection of the eaves, which would cut off the high light. The stud being twelve feet, the window heads are ten feet from the floor.

The windows in the wing are small. In the side exposed to view, we see three, each one foot by two in size, and one foot square. They are placed near the ceiling; this, with the elevation added by the sub-floor space of four feet, protects the occupants of the cloak-room and privy from annoyance. They ought to be easily opened. Those in privies should be hinged at the lower side so as to tilt inwards.

The small windows, a foot square, open into the passage which isolates the privy. There is a corresponding window in the rear, so that a through-current is kept up. These windows are not glazed but fitted with a lattice or louvre, which ought to be white, to allow light to pass.

There are few exterior ornaments. The chimney is placed outside of the school-room, in deference to the suggestion of Mr. Boyden, who drew the view; and a trifle of wood-work is added to relieve the bare effect. A chimney-cowl is not often wanted, in the open country, and none is represented.

The plan, corresponding to the view, represents a school-room, with an east and a west wing.

There is no room or passage shared by both sexes, except the school-room. Behind the teacher's desk (right) is an arrangement of two small closets and book-shelves. The chimneys are placed so as not to break the line of the walls. The stoves are not indicated; it is expected that two will be used; their position will depend on the nature of the spot where the school is built, but the northeast and the northwest corners are likely to be suitable.

If for any reason both chimneys are built, and only one stove is

put in—or if at any time only one stove is in operation—it will then be necessary to close all openings in the disused chimney; so that a valve, cover, or register will be required for each orifice.

It is advantageous to have ventilating orifices at different parts of the room. The present plan therefore gives a point of exit at each end of the room. But if it be thought necessary, for economy's sake, to omit one chimney, the remaining one may be made to do duty in two or more places by means of sub-floor pipes, runing from the foot of the flue to one or two points at the other end of the room, and there opening through the wainscot.

Each chimney has two flues—one for smoke, the other for the escape of foul air from the room. The smoke-flue receives the stove-pipe at some point above the height of the head, and is pierced with a hole eight inches square near the floor; the latter hole is closed while the fire is making. The foul-air flue is pierced near the ceiling, and at the floor; the upper hole is to be closed in cold weather; each opening to be of the size of the flue.

The plan for introducing fresh air is given in Fig. 3. The tubes should be so arranged that a pole and wiper can be thrust through for cleaning.

The floor ought at least to have two thicknesses of boards, and an air-space may be secured by furring and plastering below the joists. This gives a great protection against cold. Since plastered walls are generally out of repair, it is well to finish the walls and ceiling in wood (the former painted a light bluish-gray, the latter white).

The size of the flues is 12x8 inches. In the case of a room in a large building, this would be insufficient. In a single room, exposed on two faces, the case is less exacting. But it is very easy to enlarge the ventilating capacity of the chimneys. This must not be done by simply increasing their dimensions, as that would possibly injure the draught. A better plan is to substitute an eight-inch cast-iron pipe for the brick partition between the two flues. Then, letting the pipe serve to carry off the smoke, the two flues will each be heated, and each will serve as an efficient ventilator. The pipe in this case should rest on the solid masonry at the foot of the chimney. Care must be taken to make the inside of the flues smooth, so that air may pass off without obstruction. See Fig. 9.

The wings contain porches, vestibules, fuel-rooms, privies. The general floor is of wood. A wash-stand for the boys, if wanted, may be placed in the wood-room. The doors are so arranged that the privy cannot be seen from the outside. The height is eight feet. The window in the plan of the fuel-room represents a tran-

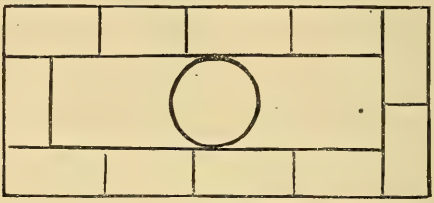


Fig. 9.

som, over the door of the room. The eighteen-inch passage beyond the wood-room is not intended to be used for any purpose except that of isolating the room beyond it. It had better be whitewashed. The girls' dressing-room is partly divided by a wooden screen, behind which is a wash-stand. It is warmed somewhat by the chimney.

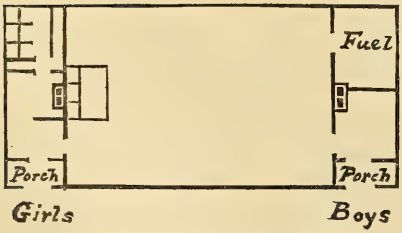


Fig. 10.

The boys' closets may be set back from the building, if it be thought that the arrangements here given are unlikely to be well cared for. Figure 10 gives this plan. It is quite likely to be preferred in many cases. It is hoped that the closet for girls will be retained as in this plan; for there is little danger of nuisance or disorder, provided the removal can be affected at frequent intervals, as above stated.

It will be noticed that in this figure and the following, doors are indicated, but not windows; and further, that the scholars face *away* from the out-house.

Figure 11 is given to show how the building can be enlarged by simply duplicating existing arrangements. Every part corresponds

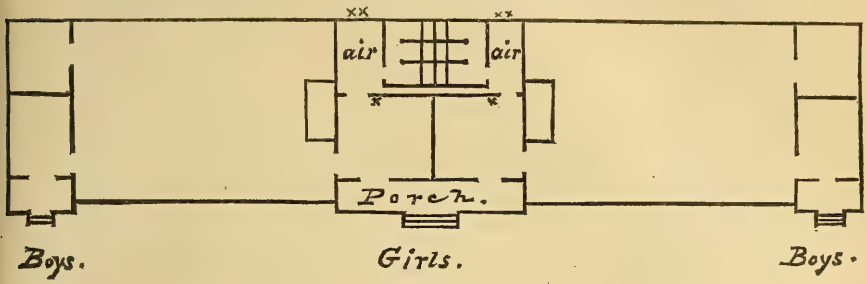


FIG. 11.

with similar parts in figure 10. The girls' wardrobes are made wider, in order to give means of lighting them from the rear. The spaces marked "air" in the rear are each five feet wide; there should be a good-sized window in each, at the back at * *, and a

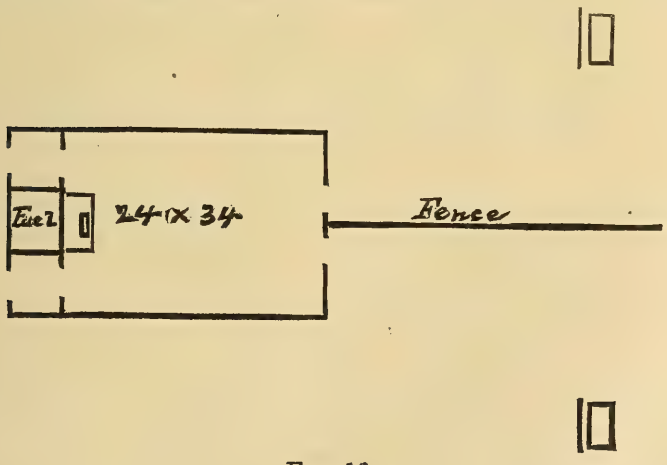


FIG. 12.

corresponding window in each wardrobe at *, besides front windows. The boys' privies are to be detached, or not, as preferred.

For various reasons, it may be thought best not to expend even the trifling sums required for the improvements mentioned in con-

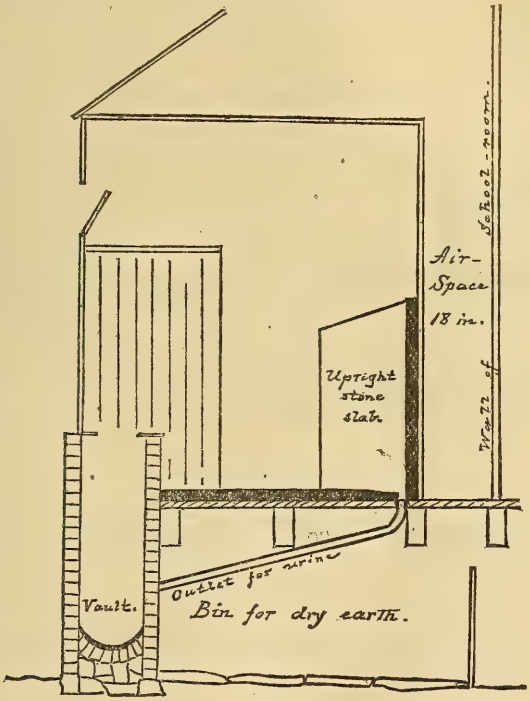
nection with the former plans. For such cases, where everything must be reduced to its simplest form, the plan (figure 12) is here offered. It differs in no respect from the ordinary type of country school-houses, except that vestibules are provided, and that complete separation of the sexes outside the school-house is secured. The doors in the rear are not necessary. Nothing in this plan is inconsistent with the adoption of the simple modes of ventilation above described. For this class of house, a simple privy, without urinal, may have to be provided; but it is strongly recommended that some arrangement may be adopted for the use of dry earth, similar to that depicted in Fig. 13, or to the bucket-closet shown in Fig. 14.

The annexed figure (No. 13) gives a sectional view of the boys' outhouse, of which the plan is given in the right of Fig. 8. The room is detached by the air-space before mentioned. It is 8 feet high, and 7 feet across, and rests on flooring continuous with the house-floor, at 4 feet above the ground-level. A window is partly open. The space underneath is suitable for storing dry earth, and may be roughly flagged; a locked door will give access to the bin. The receptacle or pit consists of a brick trough, in this case less than two feet wide, coated internally with coal tar to prevent the bricks from absorbing offensive matter. The coating should be continued over the top of the bricks and down the exposed seat-front. The bottom is an inverted arch of masonry, bedded in cement (not mortar), and coated with the same. There should be some slight projection of masonry at the outer end, to facilitate the operation of hoeing out into buckets. The depth of the pit is greater than is necessary, as it is presumed never to be filled more than a foot from the bottom.

The floor is of impervious flags (North River stone, or similar material) set in cement on the floor. At the right is seen the arrangement for a urinal. The parts which can be reached by urine are to be of slate, oiled several times so as to be impervious to fluid. The back and side pieces are $\frac{3}{4}$ inch thick; the floor-piece 4 inches, and need not reach more than two feet back; the latter is to be somewhat dished, forming a kind of a trough in the floor, which discharges through a lead pipe near the wall of the room. Proper connection must be made between the lead and the slate slab by means of a brass outlet set in the slate. The pipe may be protected against freezing, by wrapping it in straw.

The seat is of wood, and may be removed and repainted yearly. There is no wood, and no metal except the outlet in the floor, about the urinal.

It would seem simpler to place the urinals back to back against the seats. This, however, would require a slightly wider room, to allow for a passage all around, instead of in the middle.



Section of Boys' Closets

FIG. 13.

A couple of inches of earth are to be spread on the floor of the pit at first, and a little sprinkled on daily so as to cover up things, and a complete removal made weekly. The whole floor, the seats, and the entire surface of urinals, must be washed with soap and water at the week's end; a less thorough washing of the portions needing it must be made daily. Unless such care can be given, a waterless closet for boys should not be near the house.

The girls' closet has a pit of similar construction. There is very little expense about this part of the arrangements.

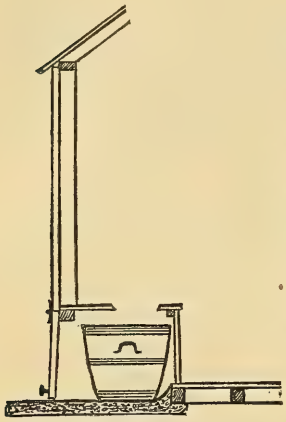


Fig. 14.

The cut (which is copied from the last report of the Massachusetts State Board) is easily understood. As for construction, it is cheaper than a common privy with vault. The tub or pail consists (if you choose) of half a kerosene-cask, provided with strong-handles. The door for removal is on the left. Earth is to be put in, as in the use of the pit; a layer at the bottom, and then a little frequently added. All woodwork must be well coated with coal-tar.

Removal is not specially troublesome or unpleasant, and will readily be undertaken without charge by farmers, for the sake of the fertilizer.

It should be stated that the idea of Fig. 6 is taken from a former report of the Michigan Board of Health.

Secretary's Report.

C. W. CHAMBERLAIN, M.D., Hartford, Conn.

SECRETARY'S REPORT.

The past year has been a busy one in our department. Although there has been no general epidemic extending over the State, yet local epidemics have been unusually prevalent and the mortality quite large. Scarlet fever has been so extensively reported, that had the manifestations of the disease been simultaneous, it would have been properly considered as epidemic over a large part of the State. Small-pox also received a good share of attention in the early months of the year, on account of the number of places in which it appeared, rather than the actual spread of the disease. The increase in the frequency of typhoid fever, the invasion of new territory by malaria, its decrease in a greater portion of the territory occupied, for a series of years, curiously interrupted by the recurrence, in quite a number of places, of acute intermittent, which had scarcely been seen for several years, only exceptional cases here and there, and the prevalence, in some instances almost universal, of malaria in places where it had before existed, but not to any great extent, all presented subjects for study and investigation as far as our means and the pressure of other work would allow.

METEOROLOGICAL CONDITIONS.

The diseases that are more or less influenced by seasons and atmospheric or meteorological conditions, like pneumonia and other acute diseases of the respiratory system, have been unusually favored by the changeable weather and its unseasonable character; thus, several warm days in winter rapidly giving place to cold of, in some instances, unusual severity. The cold of the latter part of winter and early spring were fruitful agencies in the production of acute diseases of the lungs, and have also exerted peculiarly unfavorable influences upon consumptives and the aged and feeble, increasing the mortality among them. In fact, the year has been rather a marked one with regard to the unusual number of deaths

among elderly people. Quite similar influences were exerted last year. There may perhaps be some doubt concerning the reliability of the records of old times, when there are so many deaths reported of persons over a hundred years old; as public records were not then kept, such statements cannot always be brought to book. Yet it is nevertheless certain that the deaths among the aged have been more frequent, and that, in quite a large number of cases, collateral testimony can prove or disprove the claims to an advanced age. If the occupations were more faithfully reported very valuable deductions could be drawn from a comparison of the death rates among persons of different occupations. These returns are the most incomplete that we have, and the attention of those that make the returns of deaths is especially called to this neglect of duty.

The tardy spring and prolonged cold, damp weather caused the mortality from lung fever to be extended to March, and even later. In 1882, from like causes, and a peculiarly warm, early winter, the greatest number of deaths from pneumonia, instead of occurring the first three months of the year, as has long been the case, have occurred from March to June, a larger number especially in May than has ever been recorded in this State. The past year will probably show similar figures. The increased frequency of pneumonia has already been discussed. To a proportionate extent there has been as marked an increase in bronchitis, and it is constantly increasing in importance on our mortality lists. This would be more correctly stated if all the deaths from chronic bronchitis in the aged or elderly people were reported as such, instead of as consumption, as is now too often the case. The change in the months when the mortality from pneumonia reaches the highest point is quite significant of a change in our seasons. It will be a matter of importance, as well as of interest, to see if this is due to a permanent change in the climate or only to transitory influences.

The summer months were also unfavorable to infantile life. A large number of cases of infantile diarrhea proved fatal. Singularly enough, there was a difference in the time when infantile diarrhea was prevalent to the greatest degree in different parts of the State. Thus, in Hartford the greatest mortality was in July, and New Haven was nearly free; but in August it prevailed there as frequently, proportionately, as at Hartford in July, and there were

similar variations in other places. The cause of the great mortality from infantile diarrhea has been stated as due rather to unsanitary surroundings than to the prolonged heat, although one cause reacts upon the other.

This dependence upon polluted air has been demonstrated by Dr. Lindsley, by the similarity of the results obtained in New Haven for several years. He showed that 750 of such deaths were upon unsewered streets, where excrementitious filth was stored up in vaults and cess-pools to contaminate the air, while less than half the population were on such streets. To a less extent the same researches have been made by other members of the Board, with essentially the same result, that is: that infantile diarrhea prevails especially where the air is polluted by the emanations from excrementitious organic matter. The record of its prevalence in Hartford for three years, as obtained from a careful study of the area where the greater number of cases occurred, gave about the same results as reported by Dr. Lindsley. In quite a number of cases, recently investigated, similar unsanitary conditions were found to exist where it would naturally be supposed that there could be no sanitary defects. In two instances the fault was with the surroundings of the neighbors. This and similar occurrences emphasizes the need of the execution of a systematic plan under the supervision of authority, so that the intelligent and careful may not suffer from the sins of the careless and ignorant.

Thus, from the thoroughly considered reports of Dr. Lindsley, and the supplementary studies in the same line, it seems to be evident that infantile diarrhea is caused by the deleterious influences of polluted air, or from these aided by the depression induced by prolonged high temperatures. That this is so, appears from the great mortality in cities from infantile diarrhea as compared with the country. The evils caused by adulterated or impoverished milk must not be altogether lost sight of in this connection. Bad air and bad food slaughter thousands of the innocents each year. The importance of a proper housing of the poor, and those that rent houses whose sanitary or unsanitary condition now depends entirely upon the caprice of the landlord, or more often that of his agent, whose recommendation to his employer chiefly is the amount he can secure from tenants, and the smallness of the sums

demanded for outlay upon the tenements, either in repair or improvements, and especially the latter, must be considered.

The unsanitary conditions that are too often found in and about country houses, which are so common as to be the rule rather than the exception, explain the occurrence of this disease in the country. Some of these are very graphically presented by Dr. Gardiner, who is a very careful and intelligent observer. In our manufacturing towns, especially the larger ones, nearly as unfavorable conditions are found among the tenement-house population as in the cities, and about the same proportionate mortality prevails. We have under consideration a special study of the manufacturing villages in the State. From the registration reports many interesting suggestions have been obtained. The comparatively high birth-rate, due to the preponderance of foreign population, and the prevalent diseases, among other things, indicate an interesting field of study. Some special points have already been mentioned at different occasions, but nothing like a comparative study has been made.

TENEMENT HOUSES.

Reference has been made to this subject in different connections, but it is of so great importance to sanitary reform, that insistence upon the need of a thorough revision, and, indeed, rejection, of present methods cannot be too often repeated. In the present report will be found many instances of disease, fostered by the unsanitary conditions of rented houses, and the word is used, not only to include houses overcrowded, but also all houses that are kept for rental. This, of course, makes two classes. In the first, the question of vice, want, and crime, are to be considered. That the vicious and criminal haunt such places is no less true than that the improvidence that results from vicious habits brings the innocent as well as the guilty to such places, to be depraved both morally and physically. The poor, too, are driven by their misfortunes to such quarters, as well as by vice and improvidence. Whether or no such slums cause vice directly or not, they help other agencies to do this work of degradation. If cleanliness be next to godliness, it is not strange that the decrease in vice and crime should be so marked where these old rookeries are torn down and model dwelling-houses provided. While proper housing of the poor will not dispense with the efforts to induce tem-

perance, virtue, and right living, it will be a powerful auxiliary to such efforts, and aid very much in securing the permanency of reform.

But it is the purely sanitary side with which we are specially concerned. In addition to the fearful waste of infantile life, due to the improper housing of the poor, and the infectious diseases nourished and fostered by them, and their usual surroundings, there is another way in which harm is done to society. Domestic servants, if not taken from the class that occupy crowded tenement-houses, have more or less intimate relations with those that do, through consanguinity or acquaintanceship, especially of that class that live in a few rooms, with several families on a floor. From their visits to sick friends the germs of infectious diseases are often conveyed to the homes and families of employers. This has happened in some cases that we have been able to trace, which seemed obscure, as if there could be no possible connection with any previous case. Children in such quarters have, in perhaps as many instances, conveyed infection to schools and other places, so that there are many unsanitary charges substantiated against these overcrowded quarters. In the hot season, if during no other, they can with justice be called nurseries of disease. A case in point: A family of children, four in number, were all at the same time attacked with scarlet fever, which to all appearance was sporadic; there was none near, and none within a radius of over a mile. The cases became so severe that a physician was called in consultation, who recognized the waiting-maid as having been in attendance upon a malignant case of scarlet fever in a tenement-house some ten days or more previous. This she admitted when taxed with it. She had kept silence through fear of losing her place, and partly through ignorance of the contagiousness of the disease.

It is, moreover, largely in the rented houses that we find the minimum of attention paid to sanitary requirements. Many of the defects have been already mentioned in these reports; others will be noted as some instance of the harm done by them calls attention forcibly, and renders denial impossible. The connection with such dwellings and epidemics has been very impressively illustrated in so many instances, that it seemed out of the question to longer delay a discussion of the proper drainage of tenement-houses. The paper of Mr. Gerhard, a well-known authority upon

such questions, will supply the needed information upon the subject. We should have in every city a law that should state the conditions that must be observed in every house, which, if not supplied, should prevent the renting of the house. Of course, such a law could only state the *minimum*, the least that could be required, and yet have the building in a sanitary condition, fit for occupancy. The subject will come up incidentally in recounting the unsanitary conditions that were found that were supposed to have a causal relation to disease. The importance of the question is recognized by sanitarians generally, and by some statesmen. As the kennels and slums are often profitable, requiring little supervision, no expenditure for repairs—a difficulty is just at the outset. It has, however, been shown that model tenement-houses are a profitable investment; also, properly constructed houses for low rents. While we do not have the tenement-house evils in such magnitude as larger cities in other States, like New York, for instance, yet it is bad enough here to enlist the best efforts of the intelligent and public-spirited citizens of the State.

In London the movement to improve the dwellings of the artisans and laborers—which began as a charity—now is prosecuted on a commercial basis. There have been built about 12,000 improved dwellings, which accommodate 55,000 to 60,000 people. These are lofty buildings on the many-story plan. In Glasgow the authorities have power to condemn and pull down unsanitary houses. Says Galton of London: "We insist upon educating the children of the people, and we place the children, during their school hours, in airy, spacious rooms. But follow those children who live in the more densely crowded parts of this city to their houses in confined courts, without circulation of air; their playground in the court or street—often in the midst of refuse—and learning from their parents that the only comfortable place is the gin palace or music hall. The education will be dangerous instead of beneficial if we allow the wretched dwellings, which exist in so many parts of this vast metropolis, to continue to exist. We have abolished the cess-pools which bred fever and intensified the plague of cholera; we must now abolish the wretched dwellings which are moral cess-pools, and which intensify moral disease by fostering crime and discontent."

DOMESTIC POISONS.

The danger from the indiscriminate use of powerful poisons in objects in common use frequently causes mischief. A physician recently reported a severe case of arsenical poisoning from a popular rat poison, which was stated on the label to contain no arsenic, but which proved, upon analysis, to be largely made up of that deadly poison. Several cases of severe vomiting, and in two instances of inflammation of the stomach, have been found due to some salt of copper used in giving a bright color to confectionery. One severe case of stomach disease was traced to the terra-alba, or white clay, used to give a creamy effect in so-called French confectionery. Perhaps the artificial fruit essences used in flavoring such grades of confectionery may have have had some influence in irritating the stomach.

A severe case of eruptive disease, attended with considerable swelling and irritation of the kidneys, was caused by an arsenical dye. The cheaper aniline colors, many at least, contain arsenic, and in a soluble form, readily absorbed through the skin. In this case a pair of stockings were the agency through which the poison was conveyed. A milder case, which did not give rise to any constitutional symptoms, resulted from wearing a pair of wristlets thus colored. In such cases the dye readily dissolves in cold water. It is not all discharged at one washing, but retains a portion of the coloring matter for a long time. While discussing the subject, the following case is of interest: A gentleman whose occupation led him to be away from home a good deal, noticed that whenever he returned and spent several nights in his own room, he had severe headache, a bad taste in his mouth, and colicky pains in the stomach. For a considerable time he was unable to determine any probable cause. He finally thought that there might be something wrong about his room. Upon examining the paper he found that there were no less than eight thicknesses upon his wall, and in some damp spots the paper beneath was covered with a fine mold. The outside paper was largely of a bright green with a flocculent surface. Upon examination, I found this contained large quantities of arsenic. There were here two causes for the ill health, but the symptoms of arsenical poisoning were clearly marked.

Several cases of lead poisoning have been traced: one to the use

of lead pipe to convey water from a spring, which contained more or less nitrites from the decomposition of leaves, etc. Had the water been kept running constantly, probably no harm would have resulted. Another resulted from improperly canned meats. There was an undue proportion of lead apparently in the solder, and considerable ran down into a part where fat predominated. Whether this rendered solution easier or not, there was a greater amount there than elsewhere. The part in the smaller end of the case showed no trace of lead. It is a question of increasing importance, how long are manufacturers to be allowed to needlessly jeopardize health by the use of poisons unnecessarily in articles of domestic use. The question of the danger from canned fruits has been discussed in these reports more or less. Farther investigation has shown that there is more or less solution of tin by the subacid fruit juices. The discoloration on the inside of the cans shows that some such action has taken place. Where considerable quantities of solder have carelessly been allowed to run in, traces of lead have been detected. There is not usually much likelihood that there will be enough soluble compounds of tin to do any harm. The suggestion of covering meats with waxed paper seems a very excellent and feasible method of obviating all danger. It has also been suggested that the inside of cans should be rendered insoluble by some process. Farther experience will decide whether this is necessary or not. Fortunately the danger from this source is not very great, and it is only occasionally, usually from some avoidable fault, that there is sufficient solution of the metals used to produce any ill effects. There is, however, enough importance to the subject to lead to the adoption of every means that science can offer to prevent any such solution. The importance of canned goods and the absolute necessity for their use will cause, eventually, a satisfactory disposition of all difficulties that prove realities.

GERM THEORY.

The year has been marked by an unusual activity in research. The germ theory has received special attention. The statement that from a change in nutrition, temperature, and other conditions, tersely summed in the word environment, the germs can be changed from harmless to malignant, and the reverse, which has been rendered still more probable by the work of independent

observers, renders an explanation easy of the origin of many diseases which were before difficult, if not impossible to explain. Even that protean malady, malaria, can scarcely present a problem that cannot be solved with this facile key. The divisional lines between species must not be drawn too rigorously, although there is no difficulty in distinguishing the typical forms when they occur. The probability of the germ theory has been very much strengthened. There is no doubt but that these organisms are associated with diseased conditions. There is little doubt but that certain diseases can be reproduced by inoculating the germ that has been claimed as the one that produces said disease. If the latter point is established, it only remains to learn the life history of the germs, and the conditions upon which they depend for growth and development.

The metamorphosis of germs explains the occurrence of malignant germs and diphtheretic membrane in a certain form of endocarditis, which was considered so difficult to explain heretofore, as there was no satisfactory way of accounting for the presence of the bacteria inside the heart. It should be stated that this disease has no connection with diphtheria; there is no affection of the throat. If the germ can change outside the body, there is no reason to suppose that it cannot do the same within the tissues of the body.

The *bacillus tuberculosis* has already been mentioned. The infectiousness of phthisis is established if the causative relation of that microbe to consumption is allowed. The personal element must not here be left out of the case; there must be a state of receptivity, else the disease germ finds no footing. There are germs enough produced repeatedly at short intervals to destroy the whole population of the earth many times over, were it not for this obstacle. What is it that gives such a malignancy, sometimes so that the percentage that can resist satisfactorily is so much reduced? Or, why is it that these germs act through greater spaces at one time than another? It seems fairly well established that that is the explanation of the spread of disease in an epidemic. Especial investigations have been, it is stated, made with regard to this point, in connection with diphtheria during the year. Collective investigation has shown, what was at first denied, that persons living near large small-pox hospitals are much more liable to small-pox than the average population away from such

hospitals. The germs seem to gain a power to act through larger spaces because of the massing of cases. Whatever it is that gives the germs increased malignancy, they do, in such cases, act through larger spaces; or, at least, cases occur without the close relation to preceding ones; that is the usual rule. The theory is quite generally, as it were, tacitly adopted; that is, in all discussions the nomenclature is used, and the germ of diphtheria, or whatever the disease may be, is used by many, who, if called upon for a precise statement, would state that they held the theory as probable, but not proven. That is, the precise agency of the germs is not known. We must also know more about the bacteria and the conditions of their growth before their relation to disease can be fully determined.

It is upon this line that the most promising results are offered. The theory increases the importance of telluric agencies, as the germs of many diseases find their habitat in the soil, and must be studied with regard to the effects of heat and cold, dryness and moisture, and all agencies that affect the soil. The theory, also, to some extent, settles the dispute concerning the action of sewer gases; they act as carriers of the germs of disease. But their action is not, necessarily, confined to this; they furnish the conditions for the growth and development of germs, and, if the proper conditions are supplied, increase their malignancy, or even transform an innocent germ into a malignant one. It is claimed by some that the general property of malignancy is given to germs, and it is the condition of the subject that determines whether the disease shall be diphtheria, scarlet-fever, or enteric trouble. However this may be, the condition of the person has as much to do with the production, or non-production, of disease as any other element in the case. As before stated, the factors in the case are the germ of the disease conditions favorable for its development, and a condition of receptivity in the person. The conditions that modify germ life—the life-history of these microbes—is the field for study, at the present, that offers the best promise for real progress in knowledge of the etiology and prevention of disease, and telluric agencies seem to be the more important; we certainly know least about them. By this theory, disease is to be considered as "a struggle between the organism and the parasites invading it."* This theory is strengthened by analogy. Many, if not

*Gradle, Bacteria, and the Germ Theory of Diseases, page 2.

all the diseases of plants are parasitic, and there are many diseases of animals and man that are well known to be parasitic. The parasite always conquers unless dislodged; the ordinary parasitic diseases of the hair and beard illustrate this, and the proof of the parasite origin of anthrax is conclusive, unless there is some error in the work, nor is it probable that so many observers would commit the same mistake. The researches in regard to relapsing fever, hog-cholera, and other diseases of animals and man, especially those relating to consumption, are all evidences in favor of the theory.

CHOLERA.

There have been many predictions that we shall have an outbreak of cholera in America the present year. In view of this the views held in regard to its etiology and prevention are of special interest. The results of the Cholera Commission have been quoted in the general report; those of the International Medical Congress of 1881 are substantially as follows, as given by Dr. J. S. Billings: "The government report of 1873 maintains what Pettenkofer terms the origin by contagion of cholera as opposed to its local or endemic origin in America. It does not maintain the personal contagion of the disease. Much can be done to check and stamp out an outbreak of cholera by securing pure water supplies, and by the proper use of disinfectants, and it is probable that much more can be done in the way of personal prophylaxis than in yellow fever."

He does not think that quarantine, as now maintained along our coast, would be effectual to keep out cholera, and that we have no proper means for dealing with a ship, if there were many cases of cholera on board, or a large number of passengers that had been exposed to infection.

Jamieson, in the Medical Reports for China, March, 1883,* states: "The 'local origin' theory is, therefore, that which now finds favor with the official sanitary staff in India, but the grand total of these observations leads them to no conclusion as to the *materies intirna morti*." Pettenkofer advocates the germ theory. The following quotations give some of his conclusions:

"As it may now be regarded as established, that the cholera germ is distributed from cholera-stricken places by means of

* Jamieson's Health of Shanghai for half year ending March, 1883, p. 28, *et seq.*

human intercourse, but that it always requires a certain local condition in order to develop epidemically, the question which next arises, and the solution of which is essential to the advance of our knowledge, is this: wherein does this local condition consist, and how does it arise? The parasitic doctrine alone renders it possible to answer this question, which is alike so important from the scientific and from the practical side. In any case we have to do with a process depending on the life of low organisms and with the local conditions surrounding the process itself. I have no objection to call any soil on which epidemics thrive, unhealthy. If the explanation lies in a certain accommodation of the organisms to their environment, that is to say to different nutritive fluids, all such conditions must be sought in the soil, or in the house, and brought to light."

The following suggestions of the German Commission, as to the means of its prevention, are so important, generally in their relation to other diseases, as well as cholera, that they are given in full:

"Among all the measures that may be adopted for the purpose of repelling and combating cholera, those are of the first importance which aim at an amelioration of general sanitary conditions. All specific measures, directed exclusively against cholera, will prove useless until in inhabited places satisfaction is given to those demands which rather aim at the cleansing of the soil from rapidly putrefying organic matters, at drainage, continual flushing of sewers, frequent emptying of privies, impartial abolition of cess-pools, supervision of dwellings, and closure of those that are certainly dangerous, provision of pure water for drinking and domestic purposes, and the like. *These precautions assert their sanitary influence only when they are continually observed;* and those persons deceive themselves who expect by observance of them only, when an epidemic is nigh, to enjoy protection against disease-producing influences. The italics are our own. The importance of the doctrine of transformation of microbes, or the germs of disease, does not at first appear; it however enables us to explain satisfactorily, without recourse to the idea of spontaneous generation, or of connection with any preceding case, the sporadic occurrence of scarlet fever, typhoid fever, dysentery, and malaria, and other perplexing facts, under any other theory. It is considered by

Jamieson as "destined to dominate in the near future the entire field of bacterial pathology."

The examination of the gutter-mud of New Orleans by Dr. Sternberg showed that "pathogenic varieties of bacteria are not alone bred in the bodies of living animals." "The gutter-mud of to-day, with its deadly septic organisms, is the dust of to-morrow, which in respiration is deposited upon the mucous membrane of the respiratory passages of those who breathe the air loaded with it." The dangers arising from the pollution of air and water by the germs of disease has long been under-estimated. The knowledge we have already gained concerning the ground-air and ground-water aids us in understanding how this pollution may be caused. The facts demonstrated by Profs. Smith and Pumpelly, under the direction of the National Board of Health, were a great addition to our knowledge, as far as they went. It was a great misfortune that these investigations were stopped by the lack of funds, Congress refusing to make further appropriations. They showed the utter worthlessness of sand as a filter for germinal matter, and the dangers from the transmission of germs through the soil. By the circulation of the ground-air and ground-water these germs of disease are conveyed to wells or other sources of drinking-water, or even brought to the atmosphere. The pollution from adjacent vaults and cess-pools is clearly traceable. While the crude materials are disposed of, the germs of disease are, with the other products of putrefaction, carried to considerable distances by the ground air or water. Sewer gas is air defiled by organic impurities, the products of putrefaction, and the germs of disease. The sanitary authorities of New York state that "the imperfect, incomplete, and broken sewers have caused the soil of whole districts to become so charged with sewage that the point of saturation is reached. Nearly four millions of people pour their waste into the river and harbor, as is most convenient, while miles of her shores are built upon wooden wharves built upon piles, not alone themselves undergoing decay, but a fertile source of the detention of putrefying material. The New York physician will tell you that, no matter what disease he has under treatment, it is with the added factor of malaria from such development."* Old Hippocrates was

* "Marcy, Advance of Sanitary Science and Relations of Micro-Organisms to Disease. —*Journal of American Medical Association*, Nov. 3d, p. 500.

certainly a prophet when he placed uncontaminated soil as one of the three essential requirements for health.

SMALL-POX AND VACCINATION.

An attempt was made at the last session of the Legislature to repeal the law relating to the vaccination of school children, but did not succeed. The argument that vaccination does not rest upon a scientific basis is successfully refuted by the recent investigations in relation to anthrax and the control of disease in the lower animals by vaccination. The recent experience in Connecticut, where, in repeated instances, the progress of the disease was checked so that it made no advance, and the rapid spread, in the short intervals it had made in one or two cases before reported to the authorities, and checked by vaccination of those exposed, would of itself be proof enough of the value of vaccination. This is corroborated by the past experience in the most striking manner. The people of this State are too intelligent and can too well discriminate between cause and effect to waste money on useless purposes, and yet there is no purpose for which money is more easily obtained than for a general vaccination, when such is needed. The people that control the life insurance business are shrewd, practical people, not easily deceived, who base their methods on facts, not opinions, yet they very properly insist upon a successful vaccination before taking risks. Facts could be multiplied almost indefinitely concerning the power of vaccination to control small-pox, were there need.

There were several cases in Windsor, in the village of Poquonnoc, that originated in a way that shows the need of completely destroying or disinfecting promptly all the bedding and other infected articles. The first case was that of a young man, employed to burn some bedding that had been used by a person that died of small-pox nearly two years previously; the room had since been disused. The case was partly confluent. The other cases were traced to exposure from this, before the nature of the disease was known, except one, that of a small boy that came down shortly after the first case. It is supposed that he was playing around when the bedding was removed and accompanied the man that burned it. Indeed, that much was pretty certain; but whether he came in contact with the bedding, or in just what way he received the infection, was not so plain. By isolation of the cases and vaccina-

tion of all exposed, no other cases occurred, except the few that had been exposed before the disease was recognized and a physician called. As several days had elapsed, there was not time for vaccination in these cases before the occurrence of small-pox, but the cases were much milder than those first exposed. There were several cases in Norwich, three fatal. The spread of the disease to the extent it did was from direct violation of the orders of the health board. The body of the first patient that died was improperly buried, and a part of the bedding, such as pillows, that did not burn readily, thrown into the cove, where boys were accustomed to bathe. This was not discovered until one, at least, had in all probability taken infection from this source. One of the nurses, released to attend her own child, broke quarantine rules and visited her friends. Her brother left home for a distant town, but the authorities were notified and he was promptly arrested upon his arrival. The child of the nurse died and was buried properly, but the men did not disinfect their clothing, and others were thus exposed. Afterwards the rules of the board of health were enforced by sufficient authority, and there was no farther spread of the disease.

There were isolated cases reported in several places, and instructions were repeatedly given as to the extent and duration of quarantine, the sources from which supplies of pure vaccine could be obtained, and the powers and duties of the health authorities in the presence of small-pox. In several instances the disease was traced to domestics brought into the State, who had recently emigrated, and had never been vaccinated; a tramp, in one or two cases, introduced the disease. There were several cases in Hartford, but only the imported cases. None were infected, as vaccination is almost universal. The same was true of New Haven. In Manchester and Windsor Locks there were several cases, infected from paper rags, and in the latter place the disease broke out the second time in the same locality. It was successfully controlled, and there was no further trouble. The law concerning the responsibility of those that manage paper-mills for the vaccination of their operatives is apparently not well known.

The following instance is so striking, it is given as reported:

EFFICACY OF VACCINATION.

"Another remarkable instance of the efficacy of vaccination as a prophylactic of small-pox is related by Armistead, in his report on the Newmarket Rural District. An alarming outbreak of small-pox came to the notice of the health-officer, who found a man covered with the eruption of confluent small-pox. As this man, together with two brothers who had slept in the same bed, had been in at least two cottages, a serious epidemic was feared. Unfortunately, the district in which the outbreak occurred possesses no hospital accommodation for isolating cases of infectious disease. Immediate re-vaccination was urged upon the inhabittants, but with very partial success. About the middle of June, one of the men who had been the most active in opposing all the efforts to stamp out the outbreak, took the disease, and died of confluent small-pox. From this date Mr. Armistead's advice began to be followed, and several asked to be re-vaccinated who had previously disbelieved in its protective power. In these cases small-pox was arrested in its incubation stage by re-vaccination, so that the initiatory fever was followed by an abortive pock, and these were the last cases which occurred. There were in all sixteen cases, of which five were confluent, one semi-confluent, and eleven modified by vaccination. Of the five cases of confluent small-pox one, aged 24 years, had never been vaccinated, and only one of the other four cases had any visible signs of vaccination; but two of them had been vaccinated within two or three days of the appearance of the small pox eruption; too late, of course, to be of any service in arresting the infection. Of these five cases three died, and for days the recovery of the other two was extremely doubtful. The case of semi-confluent small-pox was a man aged 57, who had been inoculated when young; he recovered. Of the eleven cases in which the disease occurred in a very modified form, eight had marks of vaccination visible, and in the other three the progress of the disease was arrested by vaccination after the person had become infected with small-pox. Two of these deserve special mention. (1). An unvaccinated child, aged three months, who had been exposed to the strong contagion of confluent small pox, had a few modified small-pox vesicles, concurrent with the vaccination vesicles. (2). A married woman, who nursed her husband in confluent small-pox, and slept with him, had initiatory fever and other symptoms of small-pox, with a few umbilica-

ted vesicles on the face, which aborted as the vesicles of revaccination matured. Mr. Amistead adds, as a curious coincidence, that very few of the males who went to work were revaccinated in comparison with the females who stayed at home; and twice as many males as females took small-pox, and all the worst, and all the fatal cases, were amongst males."

INFECTIOUSNESS OF RAGS.

This subject has been fully discussed in our reports, and last year the methods most useful to counteract the dangers likely to arise fully described. The States of New York and Massachusetts have taken action on the subject, or rather the city of New York, which is the port of entry. The following is the action taken by the New Haven Board of Health and its results. The Seymour Paper Company have their factories at Windsor Locks. At the last meeting of the Board of Health a vote concerning admission to the port of New Haven of Egyptian rags was passed. The vote provides that such rags will be received only on certification that they have been boiled in water two hours under a pressure of fifty pounds per square inch, or to boiling in water for four hours without pressure, or through thorough fumigation with sulphurous acid gas; in case of failure of government to appoint or authorize such inspector, the board will be its own judge as to what is satisfactory evidence of proper disinfection. This note was transmitted by Mr. Whedon, the clerk of the Board of Health, to the Seymour Paper Company of New York. Last evening the following communication was received:

TREASURY DEPARTMENT,
OFFICE SUPERVISING SURGEON-GENERAL,
U. S. MARINE HOSPITAL SERVICE,
WASHINGTON, December 13, 1883.

President Board of Health, New Haven, Conn.:

SIR: You are respectfully informed that the Secretary of the Treasury has this day requested the Department of State to issue instructions to consular offices relative to the shipment of Egyptian rags to this country, forwarding a copy of the resolutions adopted by your board, and requesting that the proper officer of the United States in the rag-exporting countries where contagious diseases exist, or has recently prevailed, shall inspect the rags before shipment, and give a certificate according to the facts.

Very respectfully, JOHN B. HAMILTON,
Surgeon-General M. H. S.

More Egyptian rags are received at New Haven than at any other port in the country. The other rag-receiving ports are Boston, New York, and Portland, Me.

SANITARY ORDINANCES.

The following is a copy of an ordinance passed by the Common Council of New Britain, modeled upon the one printed in our fourth report. Its provisions are very satisfactory. As this report is in press a movement has been inaugurated to reconstruct the Board of Health of Hartford upon a more efficient basis. There is room for improvement in many places, still the improvement is constant—a sure gain each year—even if sometimes not very large. The ordinance is as follows:

An ordinance in addition to an ordinance entitled "Health."

Be it ordained by the Common Council of the city of New Britain:

SECTION 1. Every lodging-house keeper, hotel-keeper, or householder in said city, in whose dwelling shall occur a case of diphtheria, scarlet fever, small-pox, or any other malignant contagious disease, shall notify the Health Committee of said city of the same within twenty-four hours after its occurrence. The Health Committee shall, if they deem it necessary for the public health, quarantine the case, or in case of small-pox, order its removal to such place as may be designated for the reception of persons suffering from such disease, and they shall direct the disinfection of every house and disposal of all infected articles.

SEC. 2. No person living in any family wherein any person is afflicted with any of said malignant contagious diseases shall attend school or any other public assemblage of persons, without the permission of the Health Committee or the physician who shall be attending said sick person, and no person who shall have been afflicted with any of said malignant contagious diseases shall attend school or any other public assemblage of persons, until the Health Committee or the physician who shall attend such sick person shall certify in writing that such sick person is convalescent and all danger from contagion is passed.

SEC. 3. Every physician who shall attend any person who shall be afflicted with any of the above mentioned malignant contagious diseases, shall forthwith report the same to the Health Committee, giving the street and number of the house where such sick person resides, and every physician who shall attend any person suffering from any of said malignant contagious diseases where any child of the family of such sick person shall be attending any public school, shall also immediately notify the teacher of the school which such child attends of the exist-

ence of said disease in said family, and if no physician shall be in attendance on said sick person, the parents or guardian of said child shall immediately give such notice, and the teacher of such school shall exclude said child from the same until the attending physician or Health Committee shall certify that all danger from contagion is passed.

SEC. 4. Whenever any teacher or teachers shall become cognizant of the existence of any such malignant contagious diseases in any house from which children attend school, it shall be their duty forthwith to report the same to one of the acting school visitors.

SEC. 5. No public funeral shall be held of any person who shall die from any of the above mentioned malignant contagious diseases, unless with the consent, in writing, of two of the members of the Health Committee.

SEC. 6. No person shall enter a dwelling-house in which any person is afflicted with any of said malignant contagious diseases, nor shall any person living in the said dwelling-house where said disease shall exist after the said dwelling-house shall be quarantined by the Health Committee without the consent in writing of two members of said Health Committee.

SEC. 7. No person shall tear down or deface any notice or flag which shall be put up on or near any dwelling-house to give warning of the existence of any malignant or contagious disease in said dwelling-house.

SEC. 8. Every person who shall violate any of the provisions of this ordinance shall be fined not less than ten nor more than fifty dollars.

Adopted by the Common Council Jan. 5, 1883. Approved, Jan. 5, 1883, and became a law by publication, Jan. 6, 1883.

ROBERT J. VANCE, *City Clerk.*

The following ordinance of the City of Bridgeport, passed recently, is an improvement in many essential respects.

Sections three and four provide for the removal to another place on the premises if the vault is a nuisance, or a connection with the sewer if there is one in the street.

Section seven prohibits privies to be hereafter built on street lots where there is a sewer.

AN ORDINANCE RELATIVE TO THE POWERS OF THE BOARD OF HEALTH.

Be it ordained by the Common Council of the City of Bridgeport:

SECTION 1. No person shall put any putrid animal substance, or any fish, upon any land, for manure, or for any other purpose, within the distance of half a mile of the dwelling-house of any person, or within one hundred rods of any public highway, without written permission

from the Board of Health so to do. Every person violating the provisions of this section shall be liable to a fine not exceeding fifty dollars.

Sec. 2. No privy vault shall be, at any time, allowed to be filled within two feet of the surface of the ground around such privy; and no such vault shall be drained into any hole or excavation in the earth; nor shall any such vault be kept or suffered to remain in such a condition as to be offensive by its scent to the neighborhood, or to passengers in any street in this city. Whenever any vault becomes a nuisance under the provisions of this section, then the Board of Health are hereby empowered to order the abatement of the nuisance arising from the same, in any manner they may deem expedient. In case the owner or owners of such vault refuses or neglects to comply with the order of the Board, within seven days after the same has been issued, then the Board of Health may cause the same to be done at the expense of the city.

Sec. 5. Whenever any pig-sty, stable, or hennery shall become, in the judgment of the Board of Health, offensive or dangerous to the public health, then the said Board of Health may order its removal. In case the owner or owners thereof neglect or refuse to comply with such order, within seven days after the same has been issued, the Board may cause the same to be removed at the expense of the city.

Sec. 6. No building hereafter erected in the City of Bridgeport upon streets through which public sewers run at the time of such erection, shall have its drains, sinks, or leaders connected with any vault or cess-pool, unless the owners thereof first obtain permission from the Board of Health to make such connection with said vault or cess-pool. Any person violating the provisions of this section shall be liable to a fine not exceeding fifty dollars.

Sec. 8. It shall be the duty of the owner or owners of all buildings hereafter erected upon any street through which a public sewer runs, to connect the drains, sinks, and leaders of such building with the said public sewer. Any person or persons desiring to drain their building, by any other means than the public sewer, must first obtain the written consent of the Board of Health to do so, which written consent shall also prescribe the mode and manner of such drainage. Any person violating the provisions of this section shall be liable to a fine not exceeding fifty dollars for each offense.

Sec. 9. No building intended for occupancy by more than two families shall hereafter be erected in this city, unless the plan for such building shall have first been submitted to the Board of Health, who shall examine the same and ascertain whether the ventilation and drainage proposed are adequate to the wants of the building. If, in the judgment of the Board of Health, the drainage and ventilation, etc., proposed are sufficient, they shall give a certificate to that effect to the owner or owners of such proposed building, which certificate shall be

made and signed by the Clerk of said Board. Any person violating the provisions of this section shall be liable to a fine not exceeding fifty dollars for each offense.

SEC. 10. All expenses incurred by said Board of Health, under this ordinance, shall be paid by the city. Such expenses shall be a charge against the owner of the premises upon which the same exists, and against any person causing or procuring such nuisance to exist, and against every person suffering or permitting such nuisance to be done or to exist on any premises owned by or under his charge, and may be recovered in the name and behalf of the city of such person, or any of them, jointly and severally, in any proper form of action.

The sixth, seventh, eighth, and ninth sections are especially commendable. The others are, perhaps, as radical as circumstances allow.

PROPOSED ORDINANCE.

In view of the importance of the subject, the following ordinance has been prepared at the request also of local health authorities:

An Act in relation to Tenement or Dwelling Houses.

SECTION 1. From and after the first day of 188–, no house, building, or portion thereof, in the city of ————, shall be used, occupied, leased, or rented for a tenement, dwelling, or lodging-house, unless the same conform to the requirements of this act.

SEC. 2. Every house, building, or portion thereof in the city of————, designed to be used, occupied, leased, or rented, or which is used, occupied, leased, or rented for a tenement, dwelling, or lodging-house, shall have in every room which is occupied as a sleeping-room, and which does not communicate directly with external air, a ventilating or transom window having an area of three square feet over the door leading into and connecting with the adjoining room, and also such transom window of the same area over the door communicating with the entry or hall of the house; or, if this be impracticable, the room it communicates with shall have such transom window of three square feet area over the door opening into the hall or entry. Every such house or building shall have in the roof at the top of the hall an adequate and proper ventilator of a form approved by the Board of Health of the city of ————.

SEC. 3. Every such house or building shall be provided with good and sufficient water-closets or privies of a construction approved by the Board of Health. Such water-closets or privies shall be not less than one to every fifteen occupants of said house. No privies shall be hereafter constructed for any house situated upon a street in which there is

a sewer, but every such house shall have water-closets furnished with a proper connection with the sewer, adequate in all respects for the purpose, and of a form approved by the Board of Health. All such water-closets shall be provided with proper traps and with sufficient water for flushing; and every owner, lessee, or occupant shall take adequate measures to prevent improper substances from entering such water-closets, privies, or their connections, and to secure the prompt removal of all obstructions. No cess-pool shall be allowed upon any lot situated on a street in which there is a sewer. When constructed, they shall in all cases be water-tight, and arched, or securely covered over and properly ventilated, and so constructed as the Board of Health shall direct. No cess-pool or privy shall be constructed until a permit is obtained from the Board of Health, which shall inspect the proposed site and direct the construction and ventilation of such privy or cess-pool, and also its location, if the one selected shall be detrimental to the public health and safety.

Sec. 4. No vault, cellar, or underground room shall be occupied as a place of lodging or sleeping, except a permit therefor be given by the Board of Health, which shall specify the manner in which such room shall be used.

Sec. 5. Every tenement, dwelling, or lodging-house shall have proper and suitable receptacles for the reception of garbage or refuse.

Sec. 6. Whenever the Board of Health shall determine that any building or part thereof has become unfit for human habitation from any cause, or has become dangerous to life, said Board may issue an order and cause the same to be affixed conspicuously on the building or part thereof, and to be personally served upon the owner, agent, or lessee, if the same can be found in this State, requiring all persons therein to vacate such building, for the reasons to be stated therein as aforesaid. Such building or part thereof shall, within ten days thereafter, be vacated, or within such shorter time—not less than twenty-four hours—as the Board may direct. If the cause be removed, such order may be revoked.

Sec. 7. No building now erected shall be converted into a lodging-house, or leased for a dwelling, tenement, or lodging-house, unless it conform with the requirements of this act.

Sec. 8. Every dwelling, lodging, or tenement house hereafter erected or converted, shall have adequate chimneys running through every floor, with an open fire-place for every set of apartments. The floor of the cellar shall be properly cemented.

Sec. 9. All sinks, basins, and stationary tubs in every hotel, dwelling, lodging or tenement house in the city of ——— shall be provided with proper stench-traps directly under each sink, basin, or stationary tub, so connected with the waste or soil pipe and so constructed as

directed or approved by the Board of Health. The waste or soil pipe in every tenement, lodging-house, or other dwelling in the city of—— —— shall be ventilated by extending the same by means of an iron pipe of the same size to a height above the roof of the building of not less than two feet, and pursuant to the terms of a permit in writing from the Board of Health. All soil-pipes shall be made of iron, and the joints caulked with lead so as to be impermeable to gases.

Sec. 10. Whenever complaint is made to the Board of Health of defective or deficient plumbing or drainage of any dwelling or habitation in the city of ————, said Board of Health shall inspect or cause to be inspected said dwelling or habitation, and if the plumbing or drainage is found to be defective and not according to the provisions of the act they shall forthwith notify the owner or owners, or persons having the property in charge, of the defects in the plumbing or drainage, with instructions in detail of the manner in which such defects shall be remedied. If said instructions are not carried out within a reasonable time, to be determined in each case by the Board of Health, it shall be the duty of said Board of Health to cause such defects to be remedied at the expense of the owner or owners of said property, or the persons having said property in charge.

Sec. 11. The owner or owners of any building used for habitation in the city of ————, at this date erected, who shall after the first day of ——, ——, neglect or refuse to comply with the provisions of this act, shall be fined ten dollars a day for every day they shall neglect or refuse to comply with the same.

Sec. 12. It shall be the duty of all architects or builders of, or other person or persons interested in any projected dwelling, lodging, or tenement-house or other place of habitation in the city of ———, to submit the plans and specifications of any such building or buildings to the Board of Health, or an Inspector appointed by them, for approval or rejection as regards the proposed plans for the ventilation of rooms and water-closets, light and air shafts, windows, drainage, and plumbing. It shall be the duty of every plumber, or other person having in charge the plumbing work on such building or buildings, to receive a written certificate of instructions from the Board of Health or said Inspector before commencing work on said building or buildings, and to execute the work according to such instructions.

Sec. 13. It shall be the duty of any plumber or person or persons having in charge the plumbing of such building or buildings or of any part of them to inform the Board of Health or its Inspector of the completion of said plumbing work before any of it is covered up, and it shall be unlawful to cover up or conceal any part of said plumbing work until approved by the Board of Health or its Inspector.

SEC. 14. Any architect or builder who shall violate any of the provisions of this act, shall be fined not less than $100 nor more than $200 for each offense. If any plumber or any person having in charge the plumbing of any building or buildings shall violate any of the provisions of this act, he or they shall be fined not less than $50 nor more than $100 for each offense.

TYPHOID FEVER.

This disease has, as before stated, increased in frequency over nearly the whole State. It is fast resuming its former rank among the causes of death. The statistics of 1883 indicate a more decided gain than in the previous year, and a corresponding decrease in the deaths from malarial diseases.

TRANSMISSION BY MILK.

The transmission of typhoid fever by milk seems to be an established fact. There is always the intervention of infected water, however; so it is indirectly, rather than directly, that the disease is conveyed. In case of scarlet fever and diphtheria the germs are apparently absorbed by the milk, which is the direct medium for the transmission of disease. The typhoid fever at St. Pancras, England, which was very thoroughly investigated, is one of the plainest instances of transmission of this disease by milk. The well and the vault of the privy in which the typhoid dejections were cast were not over twenty feet apart. All the utensils were washed in the water from this well. The cases near the farm were also traceable to the infected milk. There were 431 cases in 276 houses; all but 63 of the 431 received the infected milk; probably, also, some of the 63 received or drank it on some occasions.

An outbreak of typhoid fever from infected milk was reported from Port Jervis, New York, traced to a dairy farm, where the milk cans and pails were washed with water contaminated with cess-pool leakage. In nearly every family which used the milk from the dairy occurred one or more cases of the fever, and the examining physicians believe that the fever germs were contained in the water used for washing the utensils. At Aberdeen, Scotland, sixteen cases occurred recently in nine families. The sanitary surroundings were of the best. Suspicion was directed to the milk supply when it was found that all these families had one and the same milk supply. The infection of the milk was as plain as in the case of Saint Pancras, where there were a large number of cases

of typhoid fever among the dairymen and helpers. Symptoms of blood-poisoning were prominent. Similar outbreaks had recently been reported from Dundee and Strichen. The reason so few cases are reported in this country is probably due to want of investigation; we have enough unexplained epidemics. The contamination of milk by disease-germs is no longer problematical; that the disease occurs through infected water has been quite generally accepted, especially in England; and now milk must be also admitted to be a medium by which typhoid fever can be conveyed.

THE TYPHOID FEVER OF AMERICA.

In the circular of the Iowa State Board of Health Dr. Farquharson claims that the typhoid fever of America is essentially different from the typhoid fever of England, and that the dejecta are not the means of its dissemination, the germs reaching other cases through the air or drinking from infected water.

In the last report of the State Board of Health of Kentucky the same ground is taken by Dr. Pinckney Thompson, who states that in his opinion typhoid fever does originate from other causes than the contagion of a previous case. He gives an instance where an epidemic was caused by decayed wood. Two regiments had encamped on ground where the trees had been girdled. Many had fallen and were decaying on the ground. A third regiment encamped in the adjacent forest of living trees. In the regiment encamped in the forest there were no cases; in the two others, in one twenty-five per cent., in the other thirty per cent., had typhoid fever. All other conditions were alike. He quotes the so-called mountain fever, which has a malarial element, as due to water contaminated by vegetable decomposition. These he considers as a link between the periodical fevers and typhoid.

The following quotation from Quain's Dictionary (1883) would seem to be as true of this country as of India, even if connection with some preceding case is the usual rule. Our author quotes it as unusually applicable: "It shall be added that while in this country (England) and in Europe generally all the evidence tends unceasingly to confirm the dependence of typhoid fever on pre-existing cases, and the dissemination by drinking-water as its chief mode of propagation, observations and investigations in India appear to show either that typhoid fever can there arise independently, o

that there is a disease not yet distinguished from typhoid fever which has a different method of rise and spread.—*Broadbent.*"

Similar views of the origin of typhoid fever are taken by Martin in "Contributions to Military Hygiene."

Farquharson claims a class relationship between malarial fevers and typhoid, and quotes Colin in favor of both views.

While it is perhaps true that there is a type of fever closely resembling typhoid that arises without any causal relation to any preceding case, like the so-called "centennial fever," and what is called cess-pool fever by some, yet the almost universal result of investigations in this State has been to connect each outbreak with some preceding case. Nor is this difficult to explain when the vitality of the germs is taken into consideration, and the cases resulting from the removal of the dejecta of typhoid patients that have been stored in vaults or refuse heaps for a year or more.

ETIOLOGY.

The following statement of Professor Lindsley is a clear exposition of the views held in this State and in New England generally:

"As the typhoid fever is now understood, these are the conditions under which it is propagated: It is not directly communicable from the sick patient to another person. But the sick patient eliminates from his person, chiefly through excreta, the specific germ which gives the disease. This disease-germ is not at once infectious, but like seed cast upon stony ground, will perish if not placed in conditions favorable for its development into an active state. The conditions favorable to such development are those most similar to the conditions in which it exists, namely, in the presence of human excrement. If then the dejections from a typhoid fever patient are thrown into a vault, the germs of disease which they contain will not only be fully developed, but they also possess the power of reproduction, and so may be multiplied to an indefinite extent. But fecal matter is not the only soil in which they flourish. Any mass of decomposing organic matter seems to be equally favorable to their development and propagation when they are implanted in it. So that cess-pools, filthy drains, and filth in any form affords a fertile soil for the reproduction of the typhoid fever germs. Hence it follows that privy vaults, cess-pools, and filthy drains become centers of contagion, and dangerous localities when typhoid fever is prevalent. The danger from them is vastly

increased because the fluid portions of their contents, charged with these fever germs, permeate the soil and are carried by the underground water current to neighboring wells, which they poison. Nor only so, but the gases generated in these vaults are also loaded with the same germs and rise to the air to be inhaled, or pass by underground air in currents in the neighboring cellars, whence they are sucked, as in a chimney, to poison the air of the whole house. Every cess-pool and privy vault is, therefore, so long as it exists while typhoid fever, scarlet fever, or other infectious fevers are prevailing, a menace to the public health. Instances are innumerable where the fever has been traced directly to them and where their abolition has been followed by the disappearance of the fever. Leibermeister, one of the most recent and reliable investigators, says: 'In general we can say that the disposition of any locality to an epidemic of typhoid fever depends largely upon the extent to which the inhabitants breathe or drink the contents of their privies. It is time that an enlightened public sentiment in behalf of public safety should demand that every filth pit, alias fever nest, on the line of a public sewer, should be cleaned out and abolished.'"

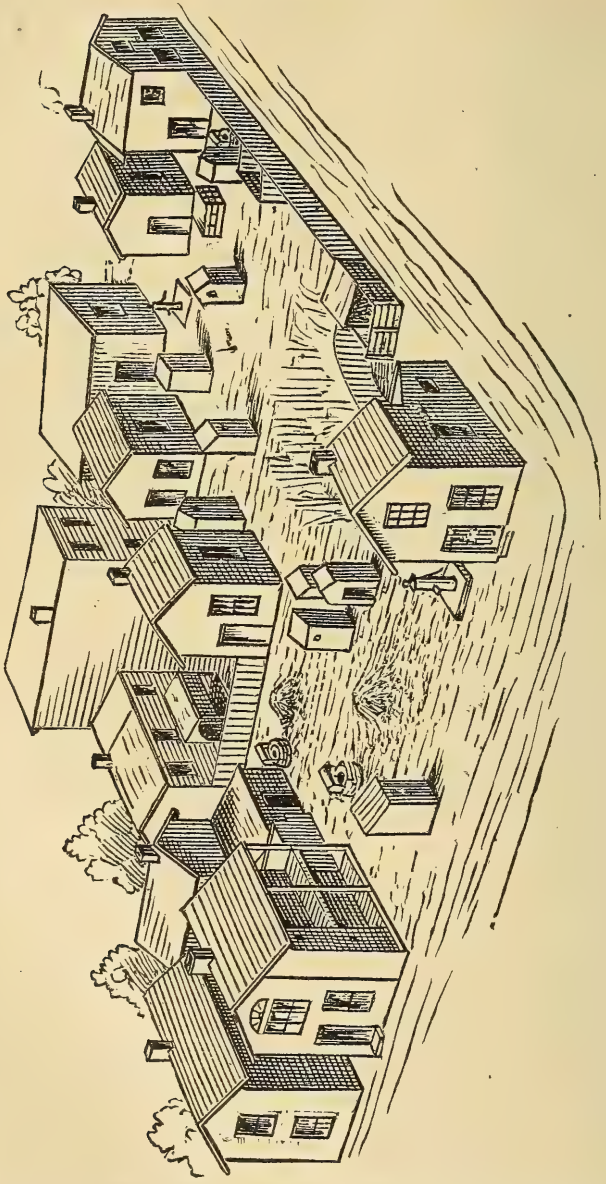
The following illustration is from a photograph of the surroundings of a series of cases of typhoid fever. There were cases in every house shown, and the mortality was above the average considerably. The privies had no vaults, and as they had not been recently cleaned and were used by a large number of people, in nearly every case there was a mass of filth that extended some distance to the rear of each. In two instances the garbage was thrown upon the mass.

The following cases in the practice of Dr. E. L. Styles, of New Britain, are kindly reported at my request as illustrating the etiology of the disease and the relations of filth to zymotic diseases.

"The following description of a few cases I have had may be of some interest to the State Board of Health:

"1. Miss B. was taken ill on the 1st of July with typhoid fever, ushered in with chills. The march of the disease was regular in its course, with no perceptible variation taking place in the symptoms until the 13th day of August. She died on the 30th, two months from the time she was taken.

"2. On the 28th, Mrs. B., the mother of the little girl, complained of dizziness and headache, of some nausea, and a feeling of general



malaise. I saw her first on the 7th of September, found her pulse 102, temperature 103½, with nausea and vomiting, and very obsti-

nate diarrhea, which symptoms increased in severity. She died on the 22d of September. At my first visit I was suspicious that there might be something about the house or grounds which was the cause of the sickness, and made a thorough investigation, with the following results: I found all the base boards around the house and veranda rotted out; the kitchen floor under the sink was also badly decayed, and an extensive degree of dampness existed under the sink, which the people state was caused by 'the sweating of the pipes.' I found the walls of the cellar damp and with some mold upon them. The distance from the house to the open well was twenty feet, and from the filthy cess-pool twenty-eight feet. Apple trees shaded the roof of the L of the house, completely covering it, and the ground in places near the house was covered with mold. I attributed the disease to these causes and had the house thoroughly renovated, new floors laid, the walls of the cellar scraped, cleaned, and whitewashed, the cess-pool opened and cleaned, the trees cut from the house, and other similar measures taken. How far I was correct in my views may be known when I state that since that time there has been no sickness whatever in the family.

"One of my next-door neighbors had a very filthy back yard. Not knowing the condition of things, I advised a lady patient, who came to me for treatment from a neighboring town, to secure board with the family, that I might see her every day. For exercise, I advised her to walk out in the yard a little every day. This she did, sometimes sitting for a short time on the veranda. On the 10th of August she was taken with diphtheria, four days after coming here.

"The next case was that of the servant-girl of the family. As soon as she was taken ill I had her removed to a friend's, on higher ground, and her sickness proved to be abortive typhoid fever.

"A boy of fourteen, living next door, while engaged picking pears from a tree in the yard, dropped something, which he looked for in a rubbish heap which had been in the yard no one knows how long. In a few days he was taken sick, and had a severe attack of typhoid fever with relapses, lasting five or six weeks.

"The next case was that of a little boy of the family, who had a very severe attack of diphtheria.

"I mention these four cases, believing they all originated from the same causes, namely, the rubbish heap in the back yard, which

contained a little of everything—waste from the table and house, fish skins, decayed cabbages, leaves, and similar garbage and refuse."

The history of many series of cases and epidemics has repeatedly illustrated this method of the transmission of the disease. There is no necessity, however, to reject the evidence as to other modes of origin. There is an interesting statement made by Prof. Pagliani in the *Archives de Biologie*, concerning the relation of the rainfall to the prevalence of typhoid fever in Paris. He has observed that for the last three years a heavy rainfall is followed, in about two weeks, by an increase in the number of cases of typhoid fever, and in four or five weeks an increase in the number of deaths from this cause. The exact influence exerted is not determined. He ascribes it to the obstruction of the sewers, and the reflux of sewage thus caused; but this explanation does not receive unqualified approval.

In the Army Medical Reports of England for 1881 an account of an epidemic is given, "traceable clearly to the soldiers drinking water contaminated by neighboring cess-pools." It is not stated whether or not there was infection from any preceding case, but the Surgeon-Major remarks with reference to cases among the Army Hospital Corps: "Many have, I fear, contracted the disease from constantly removing the excreta from the hospitals." This is according to the general belief in this region. Such instances as the following are of too frequent occurrence to discard this method of propagation. Typhoid fever was reported to be very prevalent in Napier, New Zealand. A man and three of his family died, and, upon examination being made of the house, a pool of stagnant water was found beneath it. Several other deaths occurred in the town; and, within one week, three travelers, one after the other, caught the infection and died.

SITUATION OF DWELLING-HOUSES.

The importance of a dry, well-ventilated house is generally admitted; but in selecting a site for building how little attention is paid to the natural drainage, or, indeed, the possibility of securing drainage by artificial means. The number of houses that have become death-traps through neglect of this important matter is far greater than one would believe. Said Dr. Williams, of Pomfret, one of the most careful observers, "I have seen houses that were fatal to family after family, their inmates one after another yield-

ing to New England's dread scourge, consumption. In the time of these deaths they did not impress one as due to any unusual causes, but in looking back over a long period, the facts stand out in a strong light. These houses were upon damp soil, or where the course of the ground-water was obstructed, or else rendered damp by excessive shading. This is not given in the exact words of this physician of long and wide experience, but is the substance of correspondence. He also presented similar views in an address before a farmers' club. Such experiences could be multiplied, and such observations of thoughtful, careful country physicians are of great value in showing how diseases originate. Such dwellings can well be called the hot-beds of consumption. The exclusion of the sunlight is of itself a depressing, devitalizing agency. Mankind needs the sunlight as much as the plants, and, like them, grows pale without it. The obstruction to the natural flow of the ground-water renders many houses damp, even if situated upon a hillside; just as we find swamps on a hillside, or lakes and ponds; some impervious strata interfere and prevent drainage. The relation of consumption to a damp, undrained, or too densely shaded house, is now pretty generally conceded, yet we see too many such houses. The women who spend the greater part of their lives indoors suffer in the greatest proportion. There are other disases, such as rheumatism, heart disease, and other forms that are favored and produced by damp houses. Almost every one that has lived in the country, and some dwellers in town, can readily recall experiences in paddling around cellars for various articles when the water was a foot or more deep. Although sickness and death are directly due to houses upon damp sites, but little care, compared with the importance of the subject, is shown in selecting a proper site. The paper of Dr. Gardner discusses some important features of healthy houses, and should be carefully read. In view of the relations of tenement houses to zymotic diseases and epidemics the paper is timely.

SANITATION OF CITIES.

Some points in this regard will be discussed in the special reports. The paper of Prof. Lindsley, taken from the report to the New Haven Board of Health, discusses points of so much general interest that it is reproduced here, except such parts as are of merely local interest. It is a discussion of points that are of

interest to every city of the State as well as New Haven. I commend its perusal to all health officers and health boards in our cities and larger towns. There are points of interest in the extracts from each place; they all show an awakening interest and increased watchfulness. Some of the reports of inspectors indicate the need ome vigorous sanitary work.

ADULTERATION OF FOODS.

A partial report was prepared upon this subject, but as it was incomplete it was thought best to defer any discussion and report until next year, when the subject could be treated more fully, and some justice done to its importance. The harmless nature of glucose, and the needlessness of any deleterious ingredients from the process of its manufacture, have been established by a committee from the Academy of Sciences, of which Prof. Brewer of this Board was a member. There is an inoperative law on our statute books which prohibits its sale under almost any conditions. Probably after it has been the means of annoyance to some persons it will be repealed.

The attention of sanitarians, as stated in the discussions at Detroit, should be confined to those adulterations that are deleterious to health, more particularly, rather than running a crusade against those that are harmless in themselves, but are used to adulterate higher-priced articles. When it comes, however, to lessening the degree of nourishment that an article should contain, as is the case when water is added to milk, the case is different. Then the lives of children, whose chief nutriment is thus impoverished, are involved, and too great care cannot be taken.

Reference has been made to the action taken at Detroit in reference to concerted action by State Boards of Health. In our report of the convention it was stated that such a meeting had been held of members of State Boards of Health. The circular sent by the committee there appointed to inform all State Boards of Health of the action taken at the meeting will be given later.

MALARIAL DISEASES.

These have been pretty well discussed in the preceding pages. There is one singular fact. It was stated that malaria had appeared in the center of Windham County, apparently discon-

nected from all other manifestations, and fifty to seventy-five miles from the regions in Connecticut or Rhode Island where malaria prevailed. It has since been learned that these cases did not originate there, but were factory hands that went there for work, from New Jersey. Now these people have been there several years, and deaths have taken place among them from malarial fevers; yet the seed does not take root, although they are settled in one case right near a half a dozen mill-ponds, with marshy borders, and all local conditions favorable.

If heat, moisture, and vegetable decomposition are factors, as they are in very many cases, certainly they are here supplied, and the germs of the disease also. Fifty miles or so, on either side, there are plenty of cases of malaria, yet there are as yet no cases and the disease does not spread, outside of these families. Perhaps they have not been there long enough yet; at any rate the history will be interesting to trace.

Several towns report cases of malarial disease, or deaths from some variety of malarial fever, where they have never before appeared, showing the gradual extension of the disease. This has been very gradual of late, and seems to be due rather to natural extension than to any epidemic influence, as there are few new cases except in localities where one might expect to find cases occurring from local causes.

The large number of cases that originate in winter, even in the coldest weather, are difficult to explain. In those places where malaria has been generally prevalent the cases occur right on through the winter, in less numbers, to be sure; and in the State generally, while less numerous, still a large number of cases begin in the winter months. It seems rather a stretch of theory to suppose that the infection has been either incubating or lying dormant all the time since autumn; the pollution of the ground air may have some effect; more likely, there are other agencies than those usually accepted, that cause malaria.

There have been some general changes that, had they occurred about the time malaria first appeared, might have partly explained its spread through the State; but as they did not exist to any marked degree until after malaria was generally prevalent, they could not have exerted much if any influence except upon the persistence of these diseases.

The first is the decreased rainfall for the last twelve years;

there has been a general decrease in the average yearly rainfall, so that while fifty or even fifty-six inches formerly was not unusual, if the rain-gauges were correct, we now do well if we reach forty inches in a year. By all accounts 1883 was the driest year, the rainfall in Hartford being only 35.46 inches, and less in other places. As this decrease has been largely due to denudation of the hills of their forests, which has been gradually taking place for many years, it may have been preceded by telluric changes that paved the way for malaria. Certainly the decreased rainfall would influence the level of the ground-water, and it may be that this was affected by the denudation of the hills before the average rainfall was much decreased.

The decrease in the average volume of the larger rivers of the State, notably the Connecticut, due to the indiscriminate cutting of the forests at the headwaters, is the second general cause. These are closely connected, and of themselves could only influence the persistence of malaria, and influence the question concerning its permanence, unless the causes that produced this low state of the rivers first affected the level of the ground-water, as it must have done subsequently. If wet land and marshes produce malaria when they are drying out, or are then most fruitful in its production, the decreased general level of the ground-water would cause a drying out of considerable soil that before had been permanently wet. The general history of malaria in this State shows that it has been most intense when a dry season succeeded a wet one. Also it has been repeatedly shown that the first effect of drainage has often been to cause a rapid increase of malaria. In fact, evidence is accumulating to show the importance of telluric agencies.

When typhoid fever began to reappear it was hailed as a glad intimation that we were to be freed from the long dominion of the chills, and as the periodic type began to disappear from other diseases, as it has continued to do since, the hope was strengthened.

But typhoid fever, after resuming its former rank over a large area of the State, and to a certain degree displacing malaria, has appeared content to reign side by side with malaria. In other words, it has not driven out malaria as yet to anything like the extent malaria expelled typhoid; and yet it has reached its former prevalence at least on the death records and doubtless generally, although there are places where malaria is the controlling type.

The present outlook is not encouraging. To all appearance we are to have malarial diseases always with us; at least over considerable areas of the State, just as they have so long been in New Jersey, unless some means can be devised to rid us of the unwelcome guest. To this end a topographical survey of the State is greatly needed to determine the local conditions that exist where these diseases are most prevalent. At present we have only reports from local physicians to determine these points, which are naturally influenced by their views as to the etiology of malaria; and also influenced by the amount of their experience in treating it in different localities.

The influence of local causes is seen in providing conditions favorable for the production and multiplication of these germs of disease. Here there is one general term that covers the whole ground, and that is filth. The presence of decaying organic matter, and a certain temperature, are the conditions; moist warmth is generally favorable. The germs of typhoid and typho-malarial fevers are, apparently, favored by putrescent animal matter; the diseases of the intermittent type by decaying organic matter.

There is one universal law—all the agencies that favor the growth and development of the *zymogens* are of themselves hostile to health. They are devitalizing agencies, if nothing more; they divest the air of the oxygen; but this is not all—they depress and lower the resisting power, and thus predispose to disease.

There is one other element, just indicated, that must not be left out of the question, and that is the personal one; there must be enough in a state of receptivity, in order to have an epidemic. This is the best explanation of the short wave in scarlet fever; about once in four years there are enough children of right age to have scarlet fever to form an epidemic; these are used up in the two years of prevalence, and then there is a lull for four years. Were it not for local peculiarities, the periods would be more marked than now is the case.

Whatever theory we hold, we come back, necessarily, to filth—decaying organic matter, as the agency in the production of disease; that is the most important, because under our control, to a great extent; so far as typhoid fever is concerned, it is excrementitious filth that is the element of danger. Experience is constantly accumulating, from different sources, of the causation of typhoid fever from polluted water, and air poisoned by the dejections from

typhoid fever patients, that were carelessly thrown where they were carried by the underground water currents to the wells, or in the form of impalpable powder whirled into the air by the winds. Microscopic examinations of the air of streets shows, oftentimes, some queer constituents.

Typho-malarial fever has decreased in frequency as typhoid has increased. It is, apparently, caused by similar agencies that cause typhoid. It is claimed that the dejections are as dangerous as those from typhoid fever. On this point we have no evidence to offer; directions have always been given to disinfect, on general principles of cleanliness. In South Manchester, where the disease has been more prevalent than elsewhere in Hartford county, the cases were all near a shallow pond, whose waters were contaminated with organic matter from various factories and by some sewage. It was reported that, in all the neighborhood, there was scarcely one that was free from malarial fevers, in some form; but, as reported, typho-malarial was rather the prevalent type. Although there were cases in Manchester some years ago, there has not been, until recently, that general prevalence of malarial diseases that has been the rule throughout the county, although one would have selected it as one of the first places for malaria to appear, as there are all the local conditions present that mill-ponds and decaying organic matter can afford; until recently, however, there was not so much land partly covered, nor so large an area of shallow water. Whatever the cause may have been, there is no doubt but that about the pond referred to the greater number of cases of malarial fever occurred, and that its prevalence was nearly universal. There was no unusual prevalence reported in Manchester, nor South Manchester villages, although there was more in the town generally, as it had previously escaped any general prevalence.

In many cases, typhoid and typho-malarial fevers have been reported, side by side, and even in towns that were recently invaded by the malaria, as the progress north-easterly through the State still continues. Here one would suppose the periodic type would be strong enough to drive out the typhoid fever, as was the case years ago, when the other towns were invaded; but such is not the case. Typhoid and acute intermittent occur in the same localities.

CONCERTED ACTION BY STATE BOARDS OF HEALTH.

There has been a growing conviction among leading sanitarians intrusted with the official execution of practical health measures, that while the work of the American Public Health Association is of inestimable value in promoting the interests of sanitary science and sanitary reform, there is a constantly increasing need for an annual conference of State and other officials in regard to practical affairs of their every-day work, some part of which work cannot profitably be discussed in a public meeting consisting largely of persons not familiar with its details.

After due consideration, a meeting of representatives of State boards was held at Detroit, during the recent meeting of the American Public Health Association, at which, after discussion, it was decided to call a meeting of the secretaries or other representatives of all State boards of health, in Washington, during May, 1884, for the purposes mentioned, and with the view of organizing a section devoted to State board work in the present association, or the formation of a permanent separate organization especially adapted to the needs of State boards of health. Drs. Henry B. Baker, of Michigan, and J. N. McCormack, of Kentucky, were appointed a committee to confer with and secure the coöperation of all the State boards in fulfilling the object of the meeting, and Drs. C. W. Chamberlain, of Connecticut, J. E. Reeves, of West Virginia, and Stephen Smith, of New York, were appointed a Committee on Organization, to report at the meeting in May. The American Medical Association meets in Washington in May; and another reason for holding the meeting in Washington is that the representatives of the State boards may also have an opportunity of conferring with the senators and representatives in Congress from their respective States, in regard to national sanitary legislation. It would seem that whenever the health authorities of all the States shall meet, discuss, and agree upon the course they will pursue with respect to yellow fever, cholera, small-pox, or any disease which endangers public health, without regard to State lines or borders, and whenever all State boards shall act in concert, con siderable progress will have been made in solving the problem of what are the best methods for national action in regard to inter-State and maritime quarantine, or inspection and disinfection, as well as in the practical control of epidemic diseases within the several States of this country.

SPECIAL INVESTIGATIONS AND REPORTS.

SANITARY CONDITIONS AT YALE.

REPORT OF COMMITTEE.

SEWERAGE OF WATERBURY.

TYPHOID FEVER IN WATERBURY.

THE TORRINGTON WATER SUPPLY.

SCARLET FEVER IN TALCOTTVILLE.

DIPHTHERIA IN HARTFORD.

WALLINGFORD WATER WORKS.

C. W. CHAMBERLAIN, M.D., SECRETARY.

SPECIAL INVESTIGATIONS AND REPORTS.

SANITARY CONDITIONS AT YALE.

Although this comes more properly within the record of 1884, as the subject is now of such general interest it is here included. The tendency of typhoid fever of late to become epidemic, especially where it appears under favorable circumstances, and its well-known fatality between the ages of fifteen and thirty, which includes the collegiate period, caused considerable anxiety to be felt when it was asserted and not denied that there was an unusual prevalence of typhoid fever in New Haven. In November there were in the city nine deaths. Rumor at once located the trouble at Yale, and the authorities received letters and messages of inquiry from all over the country. As the Secretary of the State Board of Health, I was written to and telegrams were sent from medical and sanitary papers for an account of the epidemic in New Haven. Rumor had also misrepresented the closing of the schools at Forestville on account of diphtheria to a malignant epidemic of typhoid fever, and the people were said to be in a state of panic.

A true statement was written and telegraphed to various parties. One medical paper printed an article denying the existence of any epidemic except the mild one at Waterbury, then on the decline, and the uncalled-for agitation and the exaggerated false rumors were quieted.

It is indeed one of our most important duties to allay false alarms, and explain the nature of imaginary and unreal dangers which often—if not at once promptly dealt with—cause irreparable mischief and harm. The people are easily excited by plausible statements, and, when dominated by terror, it is putting it mildly to say that their actions are never judicious. The circular explains itself, and its object, while there is no doubt concerning the sani-

tary condition of the college buildings, and of the general healthfulness of the city as a whole, as shown in many ways. Nor were there a very large number of cases of typhoid fever in New Haven in a population of between sixty and seventy thousand. Last year there was a similar prevalence of typhoid fever in Hartford during the autumn months. It is a part of the movement in the return of typhoid fever to its former place among diseases.

REPORT.

YALE COLLEGE, January, 1884.

In view of the exaggerated reports of unusual sickness and mortality among the students of Yale College, and the supposed causes of the same in alleged defects in the sanitary arrangements of the buildings occupied by the students, as also in the unhealthfulness of the city of New Haven, it has been thought advisable to institute a special inquiry in respect to the truth of these impressions and representations, and to report the results to the friends and patrons of the college.

A special committee was selected to examine and report upon the facts as they should find them. This committee consisted of C. F. Chandler, Ph.D., of the School of Mines in Columbia College; Dr. C. A. Lindsley, M.A., of the Medical Department, and Prof. Wm. H. Brewer, Ph.D., of the Sheffield Scientific School in Yale College.

Dr. Chandler was for ten years (and until very recently) president of the Board of Health in New York City, and had personal supervision of the plans for the plumbing and drainage of all the buildings erected from the time when the plumbing and drainage laws went into effect. He was also, until very recently, chairman of the Sanitary Committee of the New York State Board of Health.

Dr. Lindsley has been the health officer of New Haven for the last nine years. He is also a member of the State Board of Health in Connecticut, and a sanitarian of wide reputation.

Prof. Brewer has been a member of the Boards of Health of the city of New Haven and the State of Connecticut from the organization of each, and president of the former since 1876.

The results of the investigations of the Commission are given below. Durfee and Farnam Colleges were selected for examination for the reason that they had been subjected to special criticism

and suspicion in the reports alluded to. North Middle College resembles all the older college buildings in its arrangements for drainage, and all together are controlled by one system of sewerage, the most elaborate and expensive which has, as yet, been devised—that of Col. Geo. L. Waring.

NEW HAVEN, CONN., Jan. 10, 1884.

REV. NOAH PORTER, PRESIDENT OF YALE COLLEGE:

Dear Sir—I submit the Report of the Committee, made in accordance with your letters of Dec. 20th and 28th ult. It was impossible to secure the services of Dr. Chandler earlier, and hence the delay.

I enclose a separate communication relating to the healthfulness of that part of the town in which the college buildings are situated, and which I suggest should be published, along with the Report of the Committee, for the information of those concerned.

Yours respectfully, WM. H. BREWER,
Chairman of the Committee.

NEW HAVEN, Jan. 8, 1884.

REV. NOAH PORTER, PRESIDENT OF YALE COLLEGE:

Dear Sir—In accordance with your request we have made a careful examination of Durfee College, Farnam College, and North Middle College, together with the plans on file in the Treasurer's office, which exhibit the plumbing and drainage in Durfee and Farnam Colleges and the general drainage systems of the college grounds.

We find that the construction of the water-closets, urinals, and sinks in these buildings is in accordance with the most recent sanitary practice, and is very complete and satisfactory, and that the materials and workmanship are unexceptionable.

We observe that the original system has been supplemented by an auxiliary arrangement for ventilation, in which a constant draught is maintained by gas-burners. This serves to remove offensive odors from the water-closets, and to prevent the escape of sewer-gas, should any be formed in the drains near them. The copious automatic flushing of all the fixtures which takes place at frequent intervals, day and night, promptly and completely clears the drains, so that it is not probable that any decomposition takes place on the college premises.

A specially commendable feature of the system is the complete isolation of the closets and urinals.

By careful testing, we found both the flushing and ventilating apparatus to be in perfect working order.

In conclusion, we would say that we found nothing in either of these

buildings in an unsanitary condition, and that we are of the opinion that no sickness can be justly attributed to local causes in either one of them.

Very respectfully yours,

WM. H. BREWER, Ph.D.
C. F. CHANDLER, Ph.D.
C. A. LINDSLEY, M.D.

REV. NOAH PORTER, PRESIDENT OF YALE COLLEGE:

Dear Sir—Inasmuch as some alarm was expressed last term by some of the friends of Yale College in respect to the healthfulness of New Haven as a region, I think the following facts should be published:

First: New Haven is an unusually healthy city for one of its size and age. This is shown by its very low death-rate (stated by the National Board of Health, when it made its examination, to be the lowest death-rate of any seaport of its size in the world). The death-rate per thousand inhabitants of the whole town has ranged, since 1876, from 16.73 to 19.75.

Secondly: All the buildings of all the departments of Yale College (except those of the Scientific School, among the students of which there has been but little sickness the last term) are in one ward. This ward has had the lowest death-rate of any in the city for five out of the last seven years, the period of its present boundaries. The death-rate per thousand persons in this ward (which now contains about five thousand inhabitants exclusive of students) has been for these years, respectively, only 14.62, 9.34, 11.03, 12.17, 10.48, 11.04, and about 12 for the last year (the tables not yet worked up). These remarkably low figures over so many consecutive years are a sufficient index of the general healthfulness of the locality.

Yours respectfully,

WM. H. BREWER,
President of the Board of Health.

NEW HAVEN, CONN., Jan. 10, 1883.

The cases of typhoid fever have been as follows: one graduate and one professional student, one of whom resided on the college premises, and both of whom had overworked very seriously for several months. Both died, one at New Haven and the other at his home. Of the Senior class, Academical Department, two; one terminating in death, very early in the term, the attack having been ascribed to serious exposure: of the Junior class two, both convalescent: of the Sophomore, two or three, convalescent: of the Freshman, one, recovered. Besides these there have been two or three cases of serious illness with typhoid accompaniments, and several cases of malarious accompaniments of slight illnesses, such

as had been observed in many of the New England towns with unusual frequency, till the winter set in. In the other departments of the college no other cases of illness have occurred; and in all three deaths, two of students in the graduate department and one of the undergraduate. At present the students seem to be in their usual health and spirits, and no good reason seems to have been discovered for the sensational reports which have had more or less currency, or for the temporary alarm which these reports occasioned.

NOAH PORTER, *President.*

YALE COLLEGE, January 22, 1884.

THE SEWERAGE OF WATERBURY.

This is a manufacturing city in the western part of the State, well known for its variety of products. It is situated partly upon the hills and partly in the valley. The drainage areas are well shown by the accompanying map, also the sewerage plan. The city has long had a plentiful supply of water, but no sewers. It is to the saturation of the soil from this cause, and the upheaval of such soil, that the epidemic of typhoid fever which has been prevalent there this fall, is probably due, judging from the experience of other cities under similar conditions, as Nahant, for instance. The low state of the water, from the long-continued dry weather, doubtless aided such agencies by increasing the emanations from the soil, as well as increasing the relative amount of organic matter in the potable water.

There were no sewers to convey the germs of disease, and the cases occurred in all parts of the city. There were more cases among the manufacturing class, as that forms the larger percentage of the population. The location of the deaths, which is a fair index of that of the cases, shows no fever-nests or centers from which infection spread; nor does the location give any clue to the method of dissemination of the disease. It certainly appears as if there was some general cause or causes, which either directly produced the disease, or else enabled the germs to act through longer distances than usual. The theory of ærial transmission would also have to be invoked, unless it is admitted that under certain conditions the fever can be caused without infection from a preceding cause. The doctrine of the transformation of germs, and of their close relationship, would here come into play.

The occurrence of winter cholera, the previous winter, has been held by some as an indication that there were some general conditions present in Waterbury that were favorable to enteric diseases. The only tendencies of this kind traceable, were the facts already stated in regard to the soil saturation from several years' full water supply, with no sewers. This epidemic of winter cholera was carefully studied by the Board, and it was settled by examination of

BRICK SEWERS FOR SEWAGE AND ROOF WATER.

PIPE SEWERS FOR SEWAGE AND ROOF WATER.

BRICK SEWERS FOR SEWAGE AND ALL RAIN WATER.

PLAN OF PROPOSED SEWERAGE FOR THE CITY OF WATERBURY, CONN.

BY

RUDOLPH HERING.
CIVIL AND SANITARY ENGINEER.
PHILADELPHIA, PENNA

SCALE 650 FT. TO 1 IN.
JULY, 1882.

IRON OUTFALL SEWER INTO RIVER.

BOUNDARIES OF DRAINAGE DISTRICTS.

A-G DRAINAGE DISTRICTS.

the dejections that the flocculent matter was fibrine, and the absence of all detritus of food, absolutely, seemed to settle the question that this was derived from the blood. The nature of the symptoms would indicate this also. The symptoms and course of the disease have been sufficiently discussed in the general report. As far as I can learn, there were about two hundred cases. There were no conditions common to all that could be considered as causes; thus in some cases they used well water, in others that from the reservoirs. No satisfactory solution has yet been given of the causation of winter cholera, nor does this outbreak furnish any clue. The same was true of that in Providence, R. I., at each appearance. Without expressing any definite opinion as to the etiology of winter cholera, the facts that are known can be explained by any theory that suits best.

The need of sewerage has been acknowledged by several of our unsewered cities, and it is a pleasure to see one place after another carrying out well-matured plans. The only drawback to our pleasure is the little attention paid to the ultimate disposition of the sewage. As long as the city in question gets rid of its filth, the ultimate disposal is of no consequence, even if another hitherto pure stream is polluted, and the future consequences along the course of the stream are problematical. Of course, as long as there is no law to prevent or to protect the purity of our streams, it cannot be expected that any city will take any other than the easiest and most expeditious method of sewage disposal, which is to pour it into the nearest stream. Some cities, however, are already recognizing the short-sightedness of such a policy, and others may be compelled to do so by their neighbors, upon whom they kindly bestow their filth. The waste of so much fertilizing material, that should be returned to the soil, is another consideration that will be forced upon our attention, as the food question becomes of more imporance. That, however, is some time ahead; but the sanitary questions are already demanding a solution. So far as Waterbury itself is concerned, however, doubtless the best step has been taken, and the one most needful, just at present, to improve the general health, and prevent future epidemics; nor will there be any immediate trouble from the use of the stream—that will come later, and from the inhabitants of other places. The streams used are rapid, however, rather shallow, and have a pebbly bottom, causing a rip-

pling stream favorable to rapid oxidation of the readily destructible portions, so that there will, probably, some time elapse before trouble will arise. Should there be a long drought, and the streams become very low, there might, however, some trouble arise nearer home. Advantage is taken of both streams, so as large an oxidizing surface is obtained as possible. The time, however, cannot be very far distant when, either by the use of the separate system, with flush-tanks, or by the still more condensed plan, in use at Nahant, the sewage will be so concentrated that it can be used to advantage and profit, as is now claimed at Pullman; or, by some method of precipitation or filtration, the solids in the vast volume, from use of the combined system, can be profitably utilized; so that the problem will be satisfactorily solved, and excrementitious filth be given back to the elements from which it was derived, in accordance with the wisdom of Moses, whose methods were, if somewhat primitive, at least successful in every sense. By the subtle chemistry of the plant and sunbeam, death is transmuted into life, and filth, putrefaction, and decay made to work together for the production of beauty and elegance in form, shape, and color —the delicious fragrance of the rose, or the violet, and the homely utility of the russet grain.

When we interfere with nature's economy and interrupt her cycle of changes, which in their perpetual rounds keep all things new and clean, we incur danger at every step, which increases in rapid ratio the farther we carry our interference. Stored filth is a constant menace to health, and that place does well for itself that by aid of water or any force that is available removes its excrementitious filth from within its own borders so rapidly that there is no time for putrefaction to take place, or for the germs of disease to develop in the stagnant wastes. "Motion is life, quiescence is death" is here a good motto as far as it goes, and true withal, but it does not cover the whole case. The sewage thus promptly removed leads us to its conduits; it is of importance that they be properly and adequately ventilated. This done, there remains the house-pipes and fixtures, in themselves capable of delaying filth in its rapid or what should be rapid passage, and furnishing all the conditions requisite for sewer-gas poisoning, whatever the nature of that may be, and also all the essentials for the development and growth of bacterial life, or in other words, of the germs of disease.

It is to be hoped that the whole case will be considered and

the house fixtures properly trapped and ventilated at the outset, and that no householder will wait until his untrapped or unventilated house-drains have caused disease and death to enter his household before he adopts the safeguards that science teaches us will render safe the use of what are properly enough called modern conveniences, although the water-closet is as old as Pompeii, where models have been unearthed not many years ago. There is a great deal of senseless alarm about the dangers from sewers, when such extreme ground is taken that a house with basins and bath tubs cannot be made safe. There is danger from neglect and carelessness it is true, but all the dangers exist where cess-pools are used, with none of the advantages of sewers. With filth stored up in vaults a constantly increasing soil pollution is taking place, the well is soon reached by the underground channels that are established, so that there is no safety except in a wise use of the means of proven utility.

Given a house with all the modern luxuries properly placed in orderly arrangement, not tucked into such stray corners as cannot be utilized otherwise, well trapped and ventilated with a ventilating pipe to cut off the continuity of the street sewer, and especially with well ventilated street sewers, and one can sleep securely,—no, not sleep exactly, for there is one more step advisable,—nay the result must be secured by the plan proposed or some other. Join a voluntary sanitary association that employs a competent person to inspect the houses of its members regularly. If no such association exists, start one; become a sanitary missionary for a while. If this be out of the question, have a survey made occasionally, or whenever changes are made, by the best sanitarian you can secure. If everything is all right to-day, in time things wear out, rats gnaw holes, earthen pipes are readily broken, lead pipes open their seams and are in time corroded. So that a survey is in order once in a while, and unless your plumber is also a sanitarian, as many now are, some other inspector is better. One is apt to be partial to one's own work, and to look over deficiencies that others not interested would detect at once. In the good time coming every city will have an expert trained for this business, such as are now employed by voluntary sanitary associations.

Having finished this digression from the text, so to speak, the direct topic will be resumed.

The sewer commissioners very wisely advised that the brooks

be cleaned and their bottoms hollowed out and smoothed, and no sewage be allowed to enter into any of the smaller brooks where the sewer system provided a relief. This measure for the purity of the streams within the borders of the city is very wise and commendable. The following condensed report of the engineer who planned the works, Rudolph Hering, C. E. of Philadelphia, Pa., is given with the consent of the committee that had the matter in charge, and also the accompanying map. The plan with wise forethought is so arranged that irrigation and filtration can readily be resorted to when desired, or compelled by legislation or other cause.

REPORT OF R. HERING, CONDENSED.

Waterbury is situated at the confluence of two rivers which together make quite a formidable stream, sufficiently large even in the dry season to receive the sewage of the present population without dangerous effects to the towns below. Yet it is not so large that this condition would not change within a reasonable number of years, as the city is growing rapidly and the amount of sewage will increase proportionally. As soon as the pollution of the river is objected to by other towns, and perhaps prohibited by State laws, the city will be compelled to purify the sewage.

Fortunately there are tracts of land below the city with suitable soil, where this can economically be done by means of filtration, and to these the sewage will at some time have to be delivered. However distant this time may be, it is well, in a general way, to consider the question at present, so that the outfall sewers, which are now required, can be placed, if possible, at such heights that the sewage can eventually be delivered at the filtration works by gravity alone and not require pumping.

The fact that outfall sewers are the largest and most expensive ones, and that they are generally needed at an early day, before any but a small portion of the community can be benefitted, it is well to reduce their expense by shortening the length as much as possible, which can be done by establishing a temporary outfall. The extension of the system is usually not so rapid but that all the sewage it receives can be safely discharged for many years at places where it later would cause objections.

I have considered these points and placed the outfalls accordingly. The Naugatuck and Mad rivers naturally divide the city into three parts,* Abrigador, Brooklyn, and the city proper. Each one will have a separate outfall into the river.

* See Map.

While the sewage from Abrigador can temporarily be discharged into the Mad river at different points, as convenient, it will later have to be intercepted and carried to below its mouth, at an elevation which finally can permit of its being discharged by gravity on the filtration grounds.

The Brooklyn sewage is now most economically delivered at the foot of Bank street. When the amount of sewage becomes too great to be discharged above the dam, an intercepting sewer will have to carry it on Riverside and Burnham streets to a point below the same.

The sewage from the city proper is at present most economically discharged at the foot of Benedict street. It is the nearest available outfall, therefore requiring the shortest length of sewer, and permits of any future extension to points further down the river. It is obvious, however, that this outfall cannot always remain satisfactory. Evils will undoubtedly arise in future, with the increase of population, from an objectionable amount of filthy deposits thus discharged into the pool. When this trouble is felt, there are three ways in which it may be remedied.

1. The sewage can be carried by means of an inverted syphon to the west bank of the river, and thence to any desirable point below the dam. While this plan has many advantages, especially in view of future filtration fields on the same side of the river, it has the disadvantage of the syphon, which should be avoided unless absolutely necessary.

2. The sewage can be carried along the east bank of the river to any point below the dam. It is impracticable to discharge into the river at a point much above the city limits, except it be into the tail-race from Benedict & Burnham's manufacturing establishment, which would be very objectionable to the adjoining buildings for sanitary if for no other reasons.

3. The sewage can be conveyed from the foot of Benedict street, in an iron pipe sunk in the bed of the river and carried down through the dam, to any desirable point, and discharged into the current. While this pipe, which need be only about two feet in diameter, would become useless when purification of the sewage is demanded, it nevertheless offers the most economical plan of now disposing of the greater part of your sewage. The time when its use will be ended is very distant, and the city is then better justified in expending the necessarily much larger sum to carry the sewage to below its boundary. I have therefore concluded to advise the latter plan, when the pool above the dam becomes objectionably polluted.

He divides the city into districts as shown on the Map. A. That south of Mad river. A high ridge divides the district, which rather steeply slopes down to the river. The area is not great, and for the present the sewage can be discharged into the current of the river. But eventually an intercepting sewer must be built.

B. That west of the Naugatuck river. Its sewage can ultimately be intercepted by a sewer on Riverside street and carried to any desirable outfall. The little brook on the west of Bank street should be converted into a sewer large enough for sewage and rain-water, placed in the middle of the street. The surface-water should be used to cleanse the streets. The roof-water should be removed through the sewers as it gives a good flushing at every rain.

C to G, includes the territory between the Naugatuck and Mad rivers. The area is traversed by Great and Little brooks, which unite below the center and carry water enough to furnish power along their line. They are to a great extent covered, enclosed in conduits, and receive all the rain-water from their respective water-sheds. The other districts discharge their storm-water into the respective rivers.

The problems confronting us now are: *a.* Shall the rain-water and sewage be carried off in the same channels; *b.* Shall they be completely separated; or, *c.* Shall they be partially separated?

As the sewage is all to be disposed of by gravity without pumping, no determining feature on that score is gained.

It is stated as a fact that in heavy rains certain localities are flooded through insufficient capacity of underground channels. This is especially the case in the depression at the foot of Central Avenue, but quite generally so near the lowest parts of all steep roads. It is advisable not only to provide for an efficient underground rain-water removal along all of the main valley lines, but also to reduce the quantity of water running off on the streets, by at once admitting at least a portion of it into the sewers. This part should preferably be the clean water flowing from the roofs, and not the road-water, which carries with it much silt that would deposit in the sewers.

Further, as soon as the remaining portion of the rain-water flowing off in the roads becomes too great, it should be taken underground to the nearest valley-line channel. The drainage areas in question are narrow and long, and it does not appear likely that the rain-water, especially when relieved of the roof-water, will ordinarily accumulate to an objectionable extent, until it reaches the valley line, although in a few cases it may occur. When the streets are paved, water runs off more rapidly. In future, therefore, it may be desirable to lead more of it away underground. Shallow channels for this purpose could then be built at a few places to collect it, which is more economical than to provide for this uncertain amount at present in all of the sewers.

I have therefore concluded to recommend in general a provision for all of the rain-water only along the main valley lines of the areas.

Finally, the valley lines have to a great extent already been provided with artificial channels or sewers, and it becomes necessary to determine whether these could be made to answer the purpose of a combined removal of sewage and rain-water.

I am of a decided opinion that they cannot be so used without entailing a great expense. The most essential features of a perfect sewer are: A grade sufficient to give a proper velocity; a shape and size giving all stages of the water a concentrated flow; a regular alignment to prevent eddies; and a smooth interior surface to prevent retention of any matter that may, by decomposition, cause the air to become fouled. The grade of the present brook channels would be ample, but the three other requisites are entirely wanting.

The question then arises, as to whether the present channels can be used for rain-water exclusively, requiring the construction of sewers for sewage and roof-water only, or whether the sewers to be built should be large enough at once to carry all of the rain-water. The present channels, especially if they are repaired, by having the joints well filled and pointed with mortar and being covered, will quite well answer the purpose of rain-water removal. The sewers for sewage and roof-water would be small, being only about one-tenth to one-twentieth the size of those having to carry all the storm-water. It is therefore more economical to preserve the present channels and to build small sewers. There is moreover no objection to this treatment of the question from a sanitary point of view, and there is the advantage of not interfering with the rights of owners of water power, etc.

To recapitulate: In Districts E and F, or those of Little and Great Brooks, the present channels should be arranged to carry off rain-water alone. The sewage should be collected in new sewers proportioned to receive, besides all the house refuse water, also a part of the rain-water falling upon the roofs, and discharging finally at the Benedict street outfall. In District D, a new sewer should be built in place of the present rain-water channel from Central Avenue, proportioned for sewage and the entire rainfall, while the existing Willow street sewer can be used for the same purpose. The smaller branch sewers should be proportioned to receive only roof-water and sewage. At the foot of Willow street the rain-water can flow directly to the river, but the ordinary flow, consisting of sewage, should be intercepted and carried to the Benedict street outfall.

District G, comprising the area which drains to the right bank of the Mad river, is to be treated in the same general way as Abrigador. At present all sewers can discharge into the Mad river at convenient points. When this is no longer permissible, an intercepting sewer will have to be built. Here also I would recommend the proportioning of the sewers for the removal of roof-water, for its flushing benefits; the rest, having but a short distance to get to the river, can flow off over the surface.

It remains to examine the District C, comprising the central part of the city. It is traversed by sewers carrying the sewage of the Districts D, E, and F, which can therefore also serve as its own mains, leading to the common outfall.

The question of rain-water removal in the central district should be treated as in the districts of Little and Great brooks. The new sewers should take the roof-water, and the rest flow over the surface into Great brook, or westward into Naugatuck river, or, perhaps, where the accumulation is annoyingly great, in special and shallow culverts.

THE DETAILS.

ALIGNMENT.

The brick sewers are curved with a large radius when turning corners, but all the pipe sewers, as they are too small to be entered, should be laid perfectly straight between man-holes or lamp-holes, which are to be placed at every necessary horizontal or vertical bend, and by means of which every part of the sewer can be inspected and the place of any irregularity discovered. When turning, the entire curve is made in a man-hole. This plan is much to be preferred to the laying of pipes in curves.

SHAPE.

The shape of a channel which is to give to a body of flowing water the least resistance, and therefore the greatest velocity, is the semi-circle. As the sanitary requirements of a system demand a quick and complete removal of sewage, this shape should be given to it as near as practicable. A sewer conveying much rain-water as well as sewage, is therefore best given an egg-shaped section, as this provides nearly a semi-circular channel for the sewage and yet sufficient space above for the rain-water. In small sewers, however, for practical reasons, the circle is always to be preferred. I would, therefore, recommend to you circular pipe sewers and egg-shaped brick sewers, the latter of a form so that the ordinary flow will nearly assume a semi-circular section.

GRADE.

One of the principal qualities of a good sewer is to be as near self-cleansing as possible. This is obtained by giving the sewage a velocity sufficient to carry off in suspension all the solid matters that may be introduced. As with the same grade the velocity increases with the size, it is evident that, to secure clean sewers, not a standard rate of inclination is to be sought, but a standard minimum velocity. I have, therefore, arranged the grades so that the velocity of the ordinary flow shall not be less than a certain minimum, which I assumed as being two

feet per second, and which in the sewers recommended to you, represents a mean velocity when running full, of over three feet per second.

Wherever possible, I would recommend rather to increase the velocity towards the outfall than to diminish it. For, all matters once suspended could then not be deposited until discharged. At no point should there ever be a halting of the sewage.

SIZE.

As a minimum size for a pipe sewer I advise eight inches diameter. It is true that a much smaller size would carry the sewage, and that six inch pipes have been used in the streets. But English experience of twenty-five years has shown that it is unwise to go below eight inches, owing to the unavoidable entrance of obstructing matter.

On the other hand, the maximum size for pipe sewers should be eighteen inches in diameter, not only on account of the greater economy of brick sewers beyond this size, but because large pipes are rarely burnt to a true shape, and therefore the advantage gained from the smooth surface is more than lost by the projecting joints.

For brick sewers the minimum size adopted is eighteen inches by twenty-seven inches, which is just large enough for a small man to enter in case of necessity.

In proportioning the rain-water sewers I have calculated a discharge equal to that ordinarily expected from a rain storm of one inch fall in half an hour, allowing for evaporation, absorption, etc. In proportioning the other sewers I have assumed the maximum flow of sewage at 2,500 gallons per day per acre, one-half of which is to flow off in eight hours, and the roof-water to be admitted as equal to nine times this quantity.

DEPTH.

There is a great variance of opinion in different localities as to the average depth at which a sewer should be laid. In all cases, however, where practicable, it should be below the level of cellars to allow their drainage, if one of the main benefits of sewerage is to be gained. The cellars in your city are about eight feet deep below the street in the business portion, and probably less in the surrounding districts. In determining the grades of the main sewers I have given the surface of water, when filling them, a minimum depth of nine feet below the street, except in a few cases where it was not possible without very greatly increasing the expense of the entire system.

MAN- AND LAMP-HOLES.

In order to be able at any time and point to examine the sewers, or to clean and repair them, it is necessary to build up shafts from the sewer to surface of the street, either large enough for men to descend,

or to let down a lantern. If the latter are used they must alternate man-holes, from which the light and therefore the conditions of the sewer can be observed. Either man or lamp-holes must be placed at every change in the direction or grade of the sewer, and in pipe sewers be about 150 feet to 200 feet apart, in brick sewers 200 feet to 300 feet apart. The cover may be of iron or wood, with a moveable lid, perforated to allow of ventilation. A bucket should be suspended beneath the openings to prevent street dirt from dropping into the sewer.

The lamp-holes can be built of terra cotta pipes or of brickwork. The man-holes should be built of bricks, and have a circular or an oval section at the bottom, no less than three feet and better four feet in diameter, gradually diminishing to two feet diameter as they approach the top. Iron steps are usually built into them to facilitate access.

CATCH BASINS.

Where rain-water is to be taken into the brooks, catch-basins must be provided at the gutters to receive it. They should retain as much of the heavier silt as possible which is washed from the streets. The size of the basins must be adjusted to the locality. Traps need not be provided, as no odors are expected to arise from the brooks.

Where the rain-water from the streets is to be taken into the sewers, similar but trapped basins must be provided. Near the top of the basin, but no less than three feet below the surface, a pipe leads to the sewer. Its mouth is best trapped by an iron hood, as customary in some cities of New England. The size of the basin depends on the amount of silt likely to be brought into it. To clean them out, the basins are entered through openings with covers, laid flush with the sidewalk.

SUBSOIL DRAINAGE.

An important feature connected with the sanitary condition of the soil we live upon, is a thorough drainage of the excessive moisture which is frequently found to extend quite near to the surface and dampen the cellars. The building of sewers greatly facilitates drainage; but not by their acting as drains themselves, because they must be water-tight to prevent at any time a soakage of the sewage into the contiguous soil. While constructing them, tile drains can be laid in the same trench and led into the man-holes above the sewer opening. In very clayey soil and wet localities, branch drains should be extended to below the cellar.

CONSTRUCTION.

It has been stated that smoothness of the interior surface is of great importance in sewerage works, not only by increasing their capacity, but by preventing the retention of floating matter. It should therefore be made an essential point in the specifications. None but the best

hard-burnt and regularly-shaped bricks should be used, and cement sufficiently strong to secure great hardness, as the wear of the constant stream of water, often carrying gritty matter, is very severe. Pipes should be of vitrified clay and well glazed. I cannot recommend cement pipes, as they have to my knowledge invariably failed to give perfect satisfaction. The brick sewers up to 2 feet 8 inches horiz. diam. can be built with one ring of brick or 4 inches thick; the large ones should have two. Each ring must be carefully plastered over with cement to make the work as impervious as possible.

Inverted blocks of stoneware can be greatly recommended for brick sewers. They give a smooth surface for the sewage to flow upon, they avoid the great number of joints where the abrading power is greatest, and insure a good bearing for the brickwork. In wet ground particularly they facilitate the construction in this way.

From what has been said, it will appear that for sewer work none but the best mechanics and materials should be used, and the employment of experienced and intelligent supervision in addition thereto can also not be too strongly urged. The common failures and unsanitary condition of many sewerage works is entirely due to the fallacious idea that careful work was not needed because the sewers were covered up, probably never again to be seen.

VENTILATION.

I shall not take up any time in stating at length the importance of a good ventilation for sewers. It will be evident that the constant change of the volume of sewage must necessarily cause a corresponding change in the volume of air, and that a free communication with the atmosphere must therefore be maintained at all times. It is also clear that as the sewer air will sometimes become charged with offensive gases, they should be replaced by pure air. The simplest, most economical, and almost universally adopted means to effect this exchange is by perforating the covers of man-holes. It is never advisable to use rain-water leaders for this purpose, nor soil pipes, unless their course is well planned, their joints are securely leaded, and they are carried beyond the roof. Catch-basins connected with sewers should, as a rule, not assist ventilation, but be trapped, as their proximity to the sidewalks and windows might occasionally be offensive.

FLUSHING.

Although I have arranged the grades of the sewers so that they shall ordinarily be self-cleaning, a system is not perfect unless provision is made for an artificial cleaning. It has proved quite impossible to devise constructions and to adopt restrictive measures which will effectually prevent matters from getting into sewers that cause obstructions to the

flow. It may often become necessary to send through the sewers a flush of water to remove them.

As the Great and Little Brooks are higher than the sewers crossing them, a very excellent chance is given of turning at any time a large body of water through a part of the system. At other points it will be necessary to pen up the sewage by placing plugs or tightly-fitting wooden dams into the sewers at a man-hole, which, when drawn, will allow a large body of water to rush all at once through the lower sewer. At the highest ends, automatic flush-tanks can be used, which are fed from the city water supply, and regularly send a gush of water down the sewer. The desired effect of these small tanks, although excellent for a short distance, is however lost at a distance of 500 to 1000 feet on light grade sewers, and then other means are necessary.

CONCLUSION.

I have herewith presented a system of sewerage for the city of Waterbury which will satisfactorily answer the present and future needs, from a sanitary as well as economical point of view, if the main features are followed and the work is faithfully executed. It has not been possible in this general report to enter much into the details, which often cannot be fully determined until more factors are known and the ground is broken. In the hands of Mr. Welton, your able engineer, these will undoubtedly receive all due attention.

I have not entered into the question of house drainage, but will simply state, that no matter how well the common sewer is designed and built, if the drains, pipes, and fixtures belonging to the building are unskillfully planned or executed, the benefits of sewerage may be turned into annoyance and danger. As an essential condition to complete success, this branch of the subject should in due time receive the necessary attention. The house drainage should then be designed by a competent person, and carried out under the supervision of a responsible officer.

Respectfully submitted, RUDOLPH HERING.

PHILADELPHIA, July, 1882.

CONSTRUCTION NOTES.

In Benedict street the sewer was laid eighteen feet below the surface, and timber foundations had to be used on account of quicksand; difficulties were also encountered where the sewer is laid beneath the bed of the brooks; there is one deep cut of twenty-three feet. Pipe inlets, for house drainage, were put in at an average distance of twenty-five feet, they are six inches in diameter, and always make a proper angle with the axis of the sewer. Man-

holes are placed at every change of grade; otherwise, at every 175 feet, with iron steps built into the sides. The iron covers are perforated, for ventilation; the buckets hung beneath serve as catch-basins for silt, etc.

The flushing inlet, on Meadow street, at Great Brook is so constructed that, by opening a gate, the waters of Great Brook can be used for cleansing the main sewer. At the foot of Benedict street an overflow conveys all surplus water directly into the river, thus diminishing the volume of drainage to be carried by the cast iron pipe to the final outlet below the dam.

There are flushing tanks on Bank street, and also one on Mill street. The total length of sewer built is 305 miles; all poor material offered was promptly rejected, and the work, while in progress, has been thoroughly inspected.

The following sections of the city engineer's report are so practical, and so in consonance with the sentiments here advocated, that they are reproduced entire:

Although it may be a departure from the actual prerogatives of my position, still I cannot let this opportunity pass without urging upon you the necessity of positive and stringent rules regarding house drainage.

Having adopted an approved system of sewerage, and caused the works to be well built, it will avail little to the advantage of our city if this most important matter be left to the will and convenience of those who, to say the least, are but illy instructed in sanitary law.

It is the recognized right and duty of any person to save another from self-harm; how much more is it your right and duty to save a community from self-harm. It is an idle cry that you may not enter private premises with your restrictions. You would break a door down to tell a man if his house was on fire. Fire is a speedier but not surer destroyer than are the evils which attend improper house drainage, and while the former usually only attacks property, the latter always seizes and takes life. To you is primarily committed the trust in this matter, and your determined insistance will go a long way in securing to us the benefits of the city's expenditures in building sewers.

House drains should be under the immediate supervision of an inspector well instructed in sanitary needs, and the best and most skillful methods; they should be laid by licensed plumbers, who should be under bonds for quality of both material and work. It is the experience of many cities, not to mention our own, that there are no restrictions sufficient to hedge within reasonable bounds the unlicensed and non-

bonded plumber. Any compromise in these matters will sooner or later be felt in a direful condition of sickness and mortality, notwithstanding we may have the best known system of sewers, and the best built works.

NELSON J. WELTON,
Construction Engineer.

In addition to these very sensible and important suggestions, the ordinance which embodies them should also order that all houses on the line of the sewers should be connected properly within a reasonable time, the shorter the better. No cess-pool nor privy vault should be allowed to remain on sewered streets through another summer.

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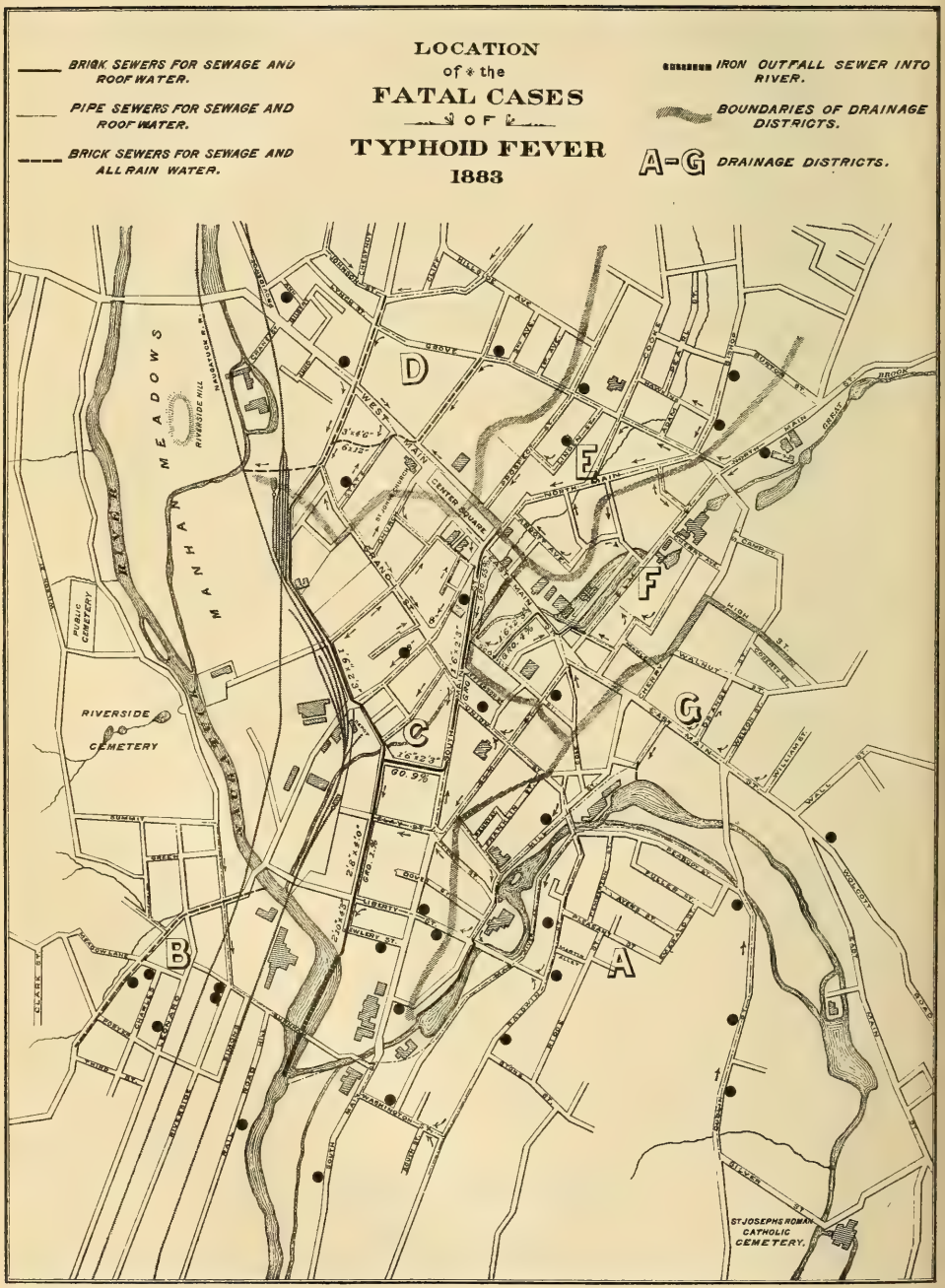
BRICK SEWERS FOR SEWAGE AND ROOF WATER.
PIPE SEWERS FOR SEWAGE AND ROOF WATER.
BRICK SEWERS FOR SEWAGE AND ALL RAIN WATER.
LOCATION
of the
FATAL CASES
OF
TYPHOID FEVER
1883
IRON OUTFALL SEWER INTO RIVER.
BOUNDARIES OF DRAINAGE DISTRICTS.
A-G DRAINAGE DISTRICTS.
MEADOWS
MANHAN
RIVERSIDE HILL
PUBLIC CEMETERY
RIVERSIDE CEMETERY
CENTER SQUARE
MAIN
WEST MAIN
NORTH MAIN
WATER
GROVE
SUMMIT
WALNUT
HIGH
RIVER
ST. JOSEPHS ROMAN CATHOLIC CEMETERY.
A
B
C
D
E
F
G

THE TYPHOID FEVER IN WATERBURY.

The general frequency of typhoid fever through the State has already been mentioned. In New Haven there were more cases than usual, while no epidemic. There were nine fatal cases in November, implying from forty to sixty cases during the month. In 1882 there were as many deaths in Hartford in one month. Thus, the disease is returning to its former prominence.

Although malaria has never been very prominent in Waterbury, there was about the same proportionate decrease in typhoid fever, until 1879, as in other parts of the State. The present epidemic has already been partly discussed in relation to the connection between the disease and the soil-pollution which has resulted from a water-supply for some time and no sewerage. As the cases were scattered pretty generally over the city, and no foci of disease stand out at all prominent where the deaths are located, this seems after all to be the best explanation available, to say the least.

There apparently was some cause that acted generally in inducing such a distribution of cases. It is not at all improbable that in the sewer excavations some old vaults were dug up in which the germs of typhoid fever were slumbering. In the condition of the people, who, from the long-continuance of the dry weather, were, as a matter of necessity, inhaling air loaded with emanations from the soil to a greater than usual degree, and using water that contained more than the usual proportion of organic and other impurities,—in this state of affairs, even if there were no general influence predisposing to typhoid fever, the introduction of the specific germ would supply all that was needed for an epidemic. All the other conditions were there. This is one of the instances that illustrate the influence of receptivity, as these conditions would predispose to enteric trouble. The increase of the soil emanations from the upheaval in cutting through deep-lying strata, for the sewers, intensified all these influences.

THE WATER-SUPPLY.

Just before the autumn rains, a number of specimens were sent from the reservoirs and from several wells. The specimens pos

sess many common characteristics. One is the increased percentage of organic matters, and the presence of infusoria in somewhat greater profusion than one would naturally expect. The clearness through a stratum of eighteen inches did not greatly vary. The amount of sediment was greatest in those from the reservoirs. The sediment was made up of sand, fragments of water plants and animals, and some flocculent matter, and the like.

As there was an unusually low state of the water in the reservoirs, and the wells also felt the effect of the long continued drought, it seemed reasonable to suppose that the condition of the water might have something to do with the causation of typhoid fever, although there was no danger to be apprehended from sewage contamination. The wells, it is true, might have been, and probably were, more or less polluted; it would be almost an impossibility that it should not be so when the soil saturation is taken into consideration. In Nahant the character of the well-water has, it is stated, very much improved since the introduction of the sewers. It will be an interesting feature here to compare the results of the examinations made of the water of the wells in Waterbury with examinations made at different periods after the sewers come into use. Specimens of the water from different sources, including wells, were examined, and the results are here stated. It is intended to secure the specimens from other wells, to be used as standards of comparison, before there has been much influence exerted upon the soil by the sewers. The following analyses are of specimens taken before the autumn rains. Wanklyn's process was used:

	No. 1.		No. 2.		No. 3.		No. 4.		No. 5.	
	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.
Tot. solid residue,	31.15	44.50	23.80	34.00	25.50	35.00	26.71	38.15	38.13	54.32
Insoluble "	22.68	31.81	16.50	23.57	16.53	2.36	29.20	41.71	29.79	42.84
Soluble "	8.47	12.10	7.31	10.44	8.97	1.28	5.50	7.21	8.34	11.91
Free Ammonia,	.....	.05	.....	.04	.....	.027	.....	.018	.....	.09
Albuminoid "	.....	.22	.....	.16	.....	.115	.....	.098	.....	.36
Chlorine,	.95	1.35	.58	1.83	2.43	3.47	3.18	4.54	6.18	8.83
Silica,	1.03	1.43	.73	1.04	.57	.81	.74	1.05	1.54	2.70

Numbers one, two, and five are from the reservoirs, directly or indirectly; the other two are from different wells. The specimens were all clear through eighteen inches, but deposited a flocculent precipitate on standing, the amount varying considerably in each. The percentage of organic matters is quite large, enough to make the specimens questionable, but not to class them as dangerous. The results of vegetable decomposition of leaves and the like is plainly indicated in the specimens from the reservoirs.

In the water from the reservoirs directly, numbers one and five, there were specimens of one or two varieties of the *nostoc* order, but not enough to cause any great degree of offensive odor unless there was an increase later in the season. There are several varieties figured in the report last year of plants of this order. The three specimens from the river directly and that from the faucets were rich in microscopic organisms, both plant and animal, but, as one would naturally expect, fewer of those associated with organic decay, as the reservoirs are in no danger from sewage pollution. There were some connected with vegetable decay, and, as also one would expect from the long drought, a larger percentage of vegetation than of the animal life that lives upon it. There were more than eighty different microscopic forms of life noted in the five specimens, few proportionately in the well-water. There were, however, some beautiful varieties of *algae*. It would take too much space to enumerate all the varieties, but a few deserve mention, the rest can only be noted by class name or that of the family or order. The water, after it had passed through the pipes, was richer to quite a degree in *diatoms;* perhaps these are developed in the pipes; at any rate, I have always found in flushings from hydrants, and when the current is reversed in pipes to stir up the sediment, an abundant supply of these organisms. In the reservoir water there were some rather unusual varieties of discoid *diatoms*, and rather more varieties of *desmids* than I have usually found. I have little doubt but that many of these organisms generate in the water mains, and form a semi-gelatinous coating occasionally. The *infusoria* were rather too abundant in the reservoir water, and with the bacteria suggested the presence of too large a proportion of organic matter for safety. Of the *algae* the *chara coronata* and several other varieties and several of the *oscillaria* were found, also some spicules of *spongillae*, but no other

evidence of its presence. The *rotifers* were not abundant, but the *cyclops* and other water crustaceans were extremely plentiful.

The results of the examination indicated that the water may have acted as a predisposing or contributing cause, especially that from wells. All the specimens contained infusoria, bacteria, and other forms of plant and animal microscopical life. They were in greater abundance than in pure water, still not to such a degree as to be dangerous necessarily, but more than is usual in pure water.

The germs of typhoid fever have never been seen; it is only the partially organized bacteria that we can recognize by any instruments of precision we possess.

The plate shows the location of the fatal cases of typhoid fever. The greater prevalence is in the manufacturing part of the city, but there also is the largest part of the population. The location of the deaths gives a good idea of the diffusion of the cases. There are no marked centres, nor is there any indication of any particular local condition that is common. The more the outbreak is studied the stronger is the impression that the soil saturation was the only local cause. If the sewerage had been much longer delayed the probability is the recurrence of typhoid fever would have been constant and in other seasons than autumn and winter, if we can judge from the analogy of other places.

WATER SUPPLY OF TORRINGTON.

The village of Torrington has a plentiful water supply of great purity. A description of the reservoir is here given, in pursuance of a plan already announced, and the results of the examination of specimens of the water from different parts of the town. That from the reservoir contains a little sand; otherwise there is little sediment, proportionately. The water was low when the specimens were taken, so the test is a severe one. The facts concerning the reservoir are kindly given by the superintendent of the water-works, Mr. O. R. Fyler.

"The Torrington water-works were built in 1878. The water supply is taken from Mine brook, a tributary of the Naugatuck. It withstands the most protracted droughts. The water-shed contains some 3,000 acres of meadow, pasture, and patches of woodland. Its slopes are quite precipitous, extending some four miles in length, and an average of one mile in width; the soil clay and gravel in about equal parts. It has no swamp drainage, but is fed from abundant springs. There are but few farm-houses or out-buildings on the slopes, and those at a distance. The stream is not traversed by roads, thus avoiding impurities from washings.

The distribution reservoir, made from a dam across the stream to the height of twenty feet, and three hundred and thirty in length, contains five and one-half acres of land, and 18,000,000 gallons of water when full, and has an average depth of about twelve feet. Great care was taken in preparing the basin of this reservoir for flowage. All vegetable matter was removed, including the grubbing of stumps and roots; the soil of the bottom is alluvial, the banks are mostly gravel. The average daily consumption of water is estimated at 300,000 gallons.

The company built, last year (1882), a storage reservoir of 51,000,000 gallons capacity. It is located some two miles above, on the same stream, and at an elevation of three hundred feet above the distribution reservoir. The water is drawn from the storage reservoir in the natural bed of the stream; the banks are alluvial and gravel, the bed of the stream small stones and gravel.

The storage reservoir, made by a dam across the brook to the height of twenty-one feet, and five hundred and thirty-four long, which flows nineteen and one-half acres of ground to a uniform depth of about seventeen feet when full; the soil is mostly an alluvial deposit underlaid with clay and hardpan; the land flowed is meadow and cleared pasture. No extensive preparation of this bottom was deemed necessary, except to remove a small amount of brushwood.

The distribution reservoir is kept full during the dry season by gradually draining from the storage reservoir.

From the building of the works up to the present year complaints were frequent of bad and impure water; the past season, with our storage reservoir brought into requisition, not one complaint has been heard; the water for the whole season has been of remarkable purity.

The conclusions drawn from this experience, for water, to be of the best quality, free from bad taste and smells, are:

1. All water-works should have a storage and distribution reservoir.
2. Distribution reservoirs should not be large.
3. Distribution reservoirs should be supplied continually from the storage reservoir, so as not to admit of stagnant water during the dry and hot part of the season.
4. That it is desirable that a storage reservoir should be located at some distance from the distribution reservoir and to follow the natural bed of the stream, rather than to conduct the water in pipes, thus aerating and purifying the water before reaching the distribution reservoir.

FLUSHING OF PIPES.

Seven gates, with pipe outlets, are located on the mains for this important purpose (hydrants do not sufficiently do the work). Frequent and thorough flushings are given the pipes, and are absolutely necessary to obtain pure water.

I think I have answered all your questions, and have given some other thoughts derived from a limited experience. Make such use of any or all as you deem best."

Very truly yours,

O. R. FYLER,

Sup't Torrington Water-Works.

The following is the result of the examination of the specimens from Torrington. There are not many finer supplies to be found anywhere. Number 3 is from flushing a hydrant:

	No. 1.		No. 2.		No. 3.	
	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.	Grains per Gallon.	Parts per Million.
Total solid residue,...	26.18	37.40	19.53	27.90	38.92	55.60
Insoluble " ...	21.93	31.32	16.48	23.54	32.87	46.95
Soluble " ...	5.25	7.50	3.05	. 4.35	6.05	8.64
Free Ammonia,....	.....	.01	.....	... .	.....	.05
Albuminoid "	.....	.03	.....	.02	.....	..15
Chlorine,.....	.75	10.70	.70	10.00	1.37	1.95
Silica,.....	7.35	10.50	1.15	1.64	9.14	1.30
Iron,.....	.11	1.57	.09	.12	.10	.14

The usual confervoid and animalcular life that is found in ponded water was found here. There were some beautiful varieties of desmids in the specimen from the reservoir direct. No. 3 was rich in diatoms, infusoria, bacteria, and detritus, the latter made up of the fragments of microscopic water animals and plants, and especially diatoms and their fragments. The water is very pure, and the flushings, if an average sample, as it doubtless is, show that the pipes are well cared for, so that but little sediment is allowed to gather.

WALLINGFORD WATER-WORKS.

The following description of the Wallingford water supply is from the pen of the engineer that planned the works. It was the intention to have presented a fuller description, but ill health prevented. These facts are printed, in this connection, for future reference and tabulation:

Wallingford, Conn., situated on the New York, New Haven & Hartford R. R., was purchased from the Indians in 1638, laid out as a village in 1673, and incorporated a borough in 1868.

Water-works were built by the borough in 1882 and 1883, after plans and under the supervision of John Osborn, C. E., taking the supply from Lake Pistapaug, four and one-half miles from and 245

feet above the center of the borough, and 315 to 350 feet above the manufacturing portion of the town.

On the north and east sides of the lake are precipitous mountains, of trap formation, thickly wooded; on the south and west are rugged hills, used for grazing purposes.

The depth of the lake through the center is from ten to thirty feet, and its present shed is 350 acres, with an additional shed of three-fourths of a square mile, which can be diverted to the lake whenever it is needed; contents of the lake, about 531,000,000 gallons.

From a point in the lake, 11 feet below its original surface, an 18-inch Akron and cast-iron pipe, 820 feet in length, conducts the water to the gate-house, from which 3,632½ feet of 12-inch pipe leads towards the borough, passing through a cut 600 feet long and 30 feet deep; then 4,505 feet of 10-inch pipe, and 15,689 feet of 8-inch pipe extending to the center of the borough. Through the streets in the borough are 14,716 feet of 6-inch pipe, 22,563 feet of 4-inch pipe, 8,194 feet of 2-inch pipe, 540 feet of 1½-inch pipe, and 482 feet of 1-inch iron pipe, making total length of pipe laid 71,141 feet, or 13 miles, 2,501 feet; depth of pipe in borough is 5 feet.

The pipes from the gate-house are all of cast-iron, excepting the 1½-inch and 2-inch, which are of wrought-iron.

Sixty hydrants and sixty-one gates have been set; also the main line has been provided with five blow-offs and six air-cocks.

There has been no analysis made of the water, but it is exceedingly pure and soft.

The average yearly rainfall, for the last twenty years, as kept by Dr. B. F. Harrison, at Wallingford, has been 49½ inches.

SCARLET FEVER IN TALCOTTVILLE.

Through the kindness of Dr. R. M. Griswold, of Manchester, I was enabled to make a survey of this charming village, as there had been quite a number of cases of scarlet fever, and the people having the general oversight of the sanitary matters concerning the village desired that everything that could contribute to the health of the village should be done.

The place is not selected for report because it is worse than others, or because there was more scarlet fever there than in other places; for many other places could have been selected where there were by far more cases, and certainly many that were in a worse sanitary condition. In fact, in many respects the village was a model. It would be difficult to find one more cleanly, or where greater attention is paid to the streets, lawns, and the garbage. There were, however, some defects, which are described, not because they are peculiar to this place, nor the direct cause of the disease (which was, in all probability, imported). Scarlet fever was epidemic in Hartford, and New Britain, and other places, with some of which there was constant intercourse, business and otherwise.

The houses are upon both sides of the river. The land upon the south side slopes gently to the river. On this side were the greater number of the houses. North of the railroad are high hills. The absence of fences gives a very pleasing appearance, and the green turf in summer contributes to the general effect.

There is a good supply of pure water for a part of the village, brought from the adjacent hill-side. The reservoirs were visited. The water is collected by a system of underground filtration, which should and probably does give a very pure supply. Two deep pits are dug, and the upper wall is strongly cemented, so that no surface water can find entrance,—although, as the watershed is uncultivated land entirely, no harm would arise should it find entrance.

There had been during the year, as nearly as I could learn, about 17 cases of scarlet fever, and about as many of a mild type of diphtheria, in the village and its immediate vicinity, and several deaths; but the exact statistics were not readily obtained. The houses that used the public water supply apparently had less cases

in proportion to those who relied upon wells, although I was not able to trace any direct connection between the cases of sickness and polluted well water.

With the general statement that, so far as any connection could be traced between the severity of the cases and the surroundings, that the worst cases were, as a rule, when the most unsanitary conditions were found, although here as everywhere, contagion must be taken into account, and a due allowance made for the cases due to it which will occur in the best arranged houses, I proceed to a description of the unsanitary conditions found.

As before stated, this is selected because here were found conditions that are quite common in a large region of country, and in other places that, like this, present nothing offensive to the eye, and where, as here, under intelligent supervision, great care is taken to protect the life and health of the inhabitants. In many respects the place could be held up as a model; the care taken in the disposition of garbage, and the general neatness and cleanliness about the whole village was especially noticeable.

There is, however, nothing perfect, and upon close inspection the following unsanitary conditions were traced : In several houses there was a method used for conveying the sink drainage away from the houses in use, that most signally failed of its object. If a method had been ingeniously contrived to saturate the cellar wall, and in many cases to convey a large part of the sink drainage into the cellar itself, this was the plan. In the first place, the lead pipe from the sink, instead of being carried a foot or two clear of the house, came down either at the middle or just at the edge of the cellar wall, and it discharged into a wooden box, a foot, or perhaps a foot and a half long, four or five inches wide, and five or six inches high, the trough itself not more than four inches deep. The sink-pipe came down into the upper end, resting upon the end board. In some cases this was all that was provided, and the whole drainage that did not go inside the cellar filtered through the porous earth just outside the wall. Wherever there was a cellar, the inner wall near the drain was moist and offensive, as was the earth in that corner of the cellar. In one instance here, this frail protection against the discharge of the whole sink drainage into the cellar was wanting, and when attention was called to the fact, the occupant stated that it had been the intention to have a

new box for some time, but it had gone so long the matter was forgotton.

In fact, I learn that that was a common method in that whole region of disposing of sink drainage ; however that may be, and I found it true quite extensively, it has always been in connection with zymotic disease. In fact, it needs no argument to show that such an arrangement that so easily allows the sink drainage to find access to the cellar, or beneath the house, is not an arrangement conducive to health. Even where there is no attempt made to carry off the drainage, as was the case in several instances, the pollution was simply less in degree. Whenever there is a sudden gush, or a large quantity of water to be discharged, there is, of course, an overflow, the trough is so small, and open at the top, invariably.

The second defect was still more insidious; there was a sink in an inside room; an addition, used as a sitting-room, had been built with no cellar. Underneath this addition ran an uncovered wooden drain, to convey the sink drainage; this discharged into an open, stone-paved gutter, kept clean by constant flushing. The ultimate disposal of the drainage was good; it was led directly to the garden by the shallow, stone-paved drain of flat stones, at a good pitch. As the wooden drain was constructed many years ago, the probabilities were that it was rotten, and near the floor odors could be detected; where the wood could be reached it was very rotten. It is needless to say there was considerable sickness in the family.

In a row of houses near the river, a well was found within a few feet of the river, and direct communication was evident as soon as water was drawn. This water was used by several families for everything except drinking, as the only other and better supply was at quite a distance. As the river is badly polluted by manufacturing waste, the water, of a dark-brown color, is anything but wholesome. The water in the well was of the same color and temperature as that of the river, and had a marked odor.

The drain from two houses joins near the well, and that from a third enters just a few feet above ; from the rank vegetation near it was suspected that the drain must be choked. Upon digging down, a wooden drain was found, entirely full from old obstructions; the cause was soon learned. As the soil was gravelly, the river bank was protected for a long distance by a heavy stone

wall, eighteen inches or more thick. There had been an opening made in the wall for this drain; but when it was laid, the ditch was two feet too deep, and instead of filling it up to the level of the opening, the drain was laid with the opening two feet lower than the hole through the wall through which it was supposed to discharge. It is but justice, however, to say that a tile drain had been ordered to take the place of the one thus found; as the facts concerning the manner in which it was laid had been brought to light. The choked drain, however, had not been discovered, but might, perhaps, have been noticed in carrying out the other work.

The other unsanitary conditions were such as are peculiar to country towns generally—too close proximity to the house of the sink-drain—when the drainage is allowed to remain where discharged, and rank vegetation keeps the ground damp and unwholesome. Too close proximity of wells to privies and drains, and too dense shading, causing dampness near to the house, and even of the house itself, were noted in a few instances. These surveys, each in turn, give opportunity to emphasize some particular unsanitary condition. Up to the time of this investigation I had never encountered the somewhat peculiar method of conveying sink-drainage described; but it has probably been overlooked, as I have seen cases enough since. Thus, in all places, even the best, hints can be gathered of use for subsequent work.

THE EPIDEMIC OF DIPHTHERIA IN HARTFORD.

BY

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Northwestern University
The Joseph Schaffner
Library of Commerce

PLAN OF THE CITY OF HARTFORD

SEWERS SHOWN BY RED LINES.

LOCATION OF DEATHS BY DIPHTHERIA. THUS
CASES SINCE NOVEMBER
MORE THAN ONE CASE AT SAME HOUSE. NOTE FIGURES. THUS. 2 3 &c.

AM PHOTO LITHO CO N.Y.

THE EPIDEMIC OF DIPHTHERIA IN HARTFORD.

For the past year diphtheria has been prevalent to an unusual extent in Hartford; in fact, for two years previous to 1883, there has been more than double the average mortality from that disease and of course a corresponding increase in the number of cases. There has also been an increase in the mortality from membranous croup, which is now generally classed with diphtheria. Unless the distinction is made, the two will be considered as identical in this article.

There have been since January, 1883, to February, 1884, 260 deaths in Hartford from croup and diphtheria, and as this is written, the evidence is clear that the average has been maintained in February, that has been kept up since October, of between twenty and thirty deaths each month.

There were fifty-nine deaths from diphtheria in 1882, and ninety from scarlet fever in 1882 and 1883. The fatal cases have been located, and for the most part indicate similar results to those shown by the map of the mortality from diphtheria. A mortality of four hundred from these diseases in two years in a population of forty-three thousand, suggests some defects in the sanitary conditions of the city.

Fifty-five of the deaths from scarlet fever were in 1883, so that the mortality from diphtheria and scarlet fever in 1883, was two hundred and eighty-nine, or one death for every one hundred and fifty inhabitants in round numbers. The reappearance of scarlet fever in December and February is not an encouraging feature. Another increase in diphtheria is not unlikely if the cold weather continues.

The accompanying map shows the location of the fatal cases of diphtheria from June, 1883, to February, 1884. Up to the first date there had not been so much increase over the usual prevalence for the last two years as to attract much attention, from that time until November, there was a marked increase, then a decrease and the maintenance of the same average each month since. As the whole mortality and two-thirds of that from scarlet fever has

been in the same localities, there was little object in locating them all as the lesson would be merely intensified by numbers and the map would have to be on a larger scale. Each fatal case from both diseases has been located with the results as stated. The scarlet fever was diffused over the city more, but the mortality was massed in the localities marked on the map, sixty of the ninety deaths were on the same streets.

The deaths from scarlet fever were mostly before June; thirty-five were in the winter of 1882, for the most part in November and December, 1882, and January and February, 1883, and nearly all the diphtheria of 1882 was in the later months. The following table shows the deaths by months. Of the deaths from diphtheria, one hundred and nineteen were males, one hundred and fifteen females. Of the ages, fifteen were under one year; one hundred and twenty-seven under five; seventy under ten; sixteen from ten to twenty; and six over twenty. Two of the deaths from scarlet fever in 1883 were of persons over twenty.

DEATHS BY MONTHS.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.
Scarlet Fever,	12	12	5	3	9	5	1	2	1		1	4	1
Croup,	7	4		3	1	1	2	3	1	6	3	3	4
Diphtheria,	10	7	7	9	3	9	18	25	31	38	22	21	21
Total,	29	23	12	15	13	15	21	30	33	44	26	28	26

The following table shows the mortality in Hartford from diphtheria for sixteen years:

Years.	Croup.	Diphtheria.	Total.	Years.	Croup.	Diphtheria.	Total.
1868	4	4	8	1876	37	54	91
1869	3	4	7	1877	15	20	35
1870	6	17	23	1878	8	9	17
1871	11	8	19	1879	15	5	20
1872	29	21	50	1880	11	17	28
1873	12	11	23	1881	16	47	63
1874	9	2	11	1882	12	47	59
1875	16	18	34	1883	34	200	234

The resemblance between the mortality indicates the relationship of the diseases; they rise and fall together. For seven years previous to 1868, the mortality was never over twenty-four, usually not over ten. There is a periodicity of six years indicated in the table ; also an inter-epidemic period, so to speak, as in scarlet fever; if the material is used up, time enough elapses for a new set of children of the susceptible ages to grow up. If there is a longer curve the statistics have not been kept long enough to show it.

Had the deaths been massed within a few months, there would have been a greater impression produced, but as they have been diffused over the year, public attention has not been so much attracted. As the greatest mortality was at a time when schools were not in session; and as it is the rule to exclude children from houses where there is a case of infectious disease; it is the average attendance, only, that has suffered, the schools have not been closed. Different parts of the city have been affected, but the chief mortality has been in the tenement houses.

The agencies that have influenced this epidemic, can be arranged as follows:

Causes outside of the houses, or external and general unsanitary conditions.

Causes within the house.

Contagion.

The last has played by far the least important role of the three. The cases since November are perhaps proportionately more due to contagion; that they have largely resulted from infection from previous cases, is indicated by their location, being almost invariably near a former fatal case. But the malignancy and persistence of the disease are due to both the first named causes. We do not find any such prevalence, except as associated with filth. The centers of infection are connected with unsanitary influences either within or external to the house.

The cases are arranged in groups, with smaller foci here and there. The first set are those near the open sewer, Little river. The second, whose center is in the northern part of Front street, are associated with unsanitary conditions arising from the lack of an intercepting sewer, the undrained meadows and open ditches, and defects in the grade of sewers. The third near Gully Brook, and its surroundings.

Other groups depend upon local unsanitary conditions to be

described later. The first set can be divided into several, nearly equal, each of which has a marked central point.

The external causes have to a greater or less degree had a general influence in polluting the atmosphere of the whole city, furnishing conditions favorable to the spread of this disease and all others of a zymotic nature. The death rate has been higher than ever before for a long series of years, if it ever was higher. The deaths under five, those from zymotic diseases and nervous diseases, are also at a high rate. There were more deaths from zymotic diseases reported in Hartford in 1883 than were reported from the whole county in 1879, while it has but one-third the population of the county. There were reported from zymotic diseases in Hartford in 1883 four hundred and four deaths. This is double the usual average previous to 1880, when the increase commenced. Thus the deaths from zymotics in Hartford were 146 in 1879, in 1880 there were reported 201, in 1881 there were 265, and 314 in 1882. There was a general decline in deaths from these diseases in 1879, and owing partially to the return of typhoid fever an increase since that year. But the increase has not been as marked nor as uniform as here, and while the last two years have shown an unusually high death rate, the increase has been more marked in this city.

The external unsanitary influences that have contributed to pollute the air, and that produce conditions favorable to disease, if they do not, as appears very probable, afford just these favoring elements that are needed to transform the germs from harmless organisms to septic parasites, are then:

1st. The sewage polluted stream, that has this year been unusually low, and its polluted bed in consequence to a greater degree exposed to the sun.

2d. The undrained meadows and lack of an intercepting sewer in the northeastern part of the city.

3d. Gully brook, and the temporary ill-effect from the disturbance of filth saturated soil in the construction of the sewer along a portion of its course.

4th. The soil pollution from cess-pools, privies, sink drains, and garbage heaps, and careless disposal of kitchen and other slops, waste, and garbage, also the mingling of sink drains and garbage with the filth from privy vaults.

5th. The ground-air polluted by contact with contaminated soil,

around vaults, cess-pools, sink drains, leaky tile drains, and soil saturated with putrescent, organic matter from kitchen slops, and the careless disposal of garbage.

The river water was substituted in a part of the city for the reservoir water. As must be the case if the small reservoir was used at all in the distribution of the river water, a large amount of stagnant water loaded with microscopic plant and animal life, to wit, the contents of the small reservoir, was sent along the pipes when the change was first made. It, however, could not have produced much effect, except the introduction of these growths into the pipes, as the first flow from the reversal of the current in the pipes was so muddy that it could not be used for a time.

These external agencies, then, were the principal ones that are to be considered in relation to the epidemic of diphtheria, also in relation to the scarlet fever that preceded; and, in fact, to the zymotic diseases generally, that prevail in this city. The cases located on the map are of pharyngeal diphtheria; as there are many that believe croup to be an entirely distinct disease the cases of croup are not located to avoid discussion when it is of no benefit.

The influence of the ground-air is the one that is least recognized. It is well known that the air does not end at the surface of the ground, but extends below the surface. An atmosphere then exists in the soil between the molecules of dirt, the particles of the solid rock, or whatever the constituents of the soil may be—the denser the soil, the rarer the atmosphere. This atmosphere is of varying depth,—from a few inches to two miles or more,—and extends down into the earth until the ground-water is reached. It has its currents and counter-currents, like the atmosphere above ground. What most concerns us is that this polluted ground-air comes into our houses, where the sources of contamination above enumerated exist from contact with decomposing organic matter, and this is, in effect, sewer gas. It has all the characteristics when drawn into the house, for the warmth it lacked is supplied. It is, in fact, largely the warmth of the house, as compared with the external air, that draws the ground-air into the house from the surrounding soil. The importance of cleanliness of soil near the house, and the need of conveying all filth away from the immediate neighborhood of the house, is thus apparent.

The law of the diffusion of gases would cause the ground-air to enter the house, even if the increased temperature did not make it a kind of a chimney, drawing in the air from a large area of soil, depending upon the character of the soil for its extent. This influence is especially exerted in winter, when the surface of the ground is frozen solid and covered with snow—but as the ground is not frozen beyond a certain depth, the ground-air is even in winter polluted by contact with decomposing organic matter.

This topic is enlarged upon, as it is somewhat obscure; it is in several cases, however, the explanation of the pollution of the air in houses otherwise in good condition. Thus, in one of the earlier fatal cases on Wethersfield avenue, there was pollution of the air from this cause,—a foul cess-pool, quite near the house,—also adjacent vaults.

There are other groups where the influence of the unsanitary conditions just described are the principal external conditions that exist. There are minor groups, where the principal unsanitary influences are to be found within the house, where the ground-air, except as polluted by leaky house-drains, is not especially impure.

The fatal cases that occurred since December first, and shown on the map by red dots, and the cases generally in the colder weather, are for the most part due to the unsanitary influences within the houses.

It is a fact worthy of notice that the fatal cases from January to June, some forty in number, were in the same localities as those shown on the map, which indicate very correctly the general prevalence of the disease.

As there have been every year more or less deaths from diphtheria, and of the forty-seven last year forty-one occurred from June to December, it is somewhat difficult to trace the starting-points of the epidemic.

The recurrence, after the apparent cessation in November, when the mortality and prevalence had very markedly decreased, shows plainly the influence of infection, the action of the older cases as foci is very clear. There are few isolated cases; every one is closely associated with a previous case; so that if not due to direct contagion, the germs were nourished in the polluted atmosphere. The progress of the disease by slow advances—not by a sudden and general outburst—is a proof of the correctness of this view.

Indeed, the whole progress has shown that unsanitary conditions

were the underlying causes. Had the disease been due to an epidemic influence, there would have been a rapid and severe course. In place of this, with the sickness and mortality crowded into a few months, we have a gradual progress that can be traced at almost every step, which increases until a maximum is reached, when a slow decrease commences. Whether there will be another exacerbation of the disease or not is uncertain.

There is no new feature indicated by the deaths in February, unfortunately the usual average since November—twenty odd each month—from pharyngeal diphtheria is continued, as up to February 23d there were thirteen deaths.

The height of the epidemic was at a time when a long-continued drought, preceded by one or more dry summers, had rendered these external unsanitary influences at their worst; also from necessity the Little river was drawn down and its whole bed exposed to the hot sun for several days. The increase commenced soon after. Whether there was any connection or not I do not know, but the fact remains.

The Little river receives three-fifths of the sewage of the city, and has one or more tributaries fully as filthy as itself. It is obstructed in the heart of the city by two dams, which form settling basins for the sewage. In a dry summer the water is thick and dark, can be smelled at quite a distance, and when there has been no rain for a long time it is constantly discharging vile-smelling gases which bubble up from the decaying sediment in its bed.

The external conditions found in connection with one nest of diphtheria, which have since been remedied to a considerable extent, as far as practicable without some general changes, were as follows: Within a few feet of a block of houses where there had been a dozen or more cases, and several in every house on the street, was a privy with an overflowing vault, with an open ditch leading to the river some rods distant; another near by had also a ditch from the sink-drain leading into it, and the combination gave rise to an intolerable stench.

Upon the other side of the street there was in one lot an overflowing vault directly under the windows of the next house, and in the next lot a series of vaults, in a very small space, that were full nearly to the surface. Radical measures were used as far as possible, but from lack of sewer the vaults could not be entirely removed; disinfection until cold weather was the only course in

some cases. Without specifying each individual case, neglected and overflowing privy vaults, situated in too close proximity to the houses, were conditions quite often found in unsewered streets.

In several groups of cases local unsanitary conditions, such as neglected privies and garbage, untrapped sewer or cess-pool connections, and unventilated cess-pools, were the external causes that influenced the location. The carelessness shown in the disposal of garbage and its decay in the yards, and the entire want of any proper receptacles for garbage, which was allowed to accumulate in large amounts, was often noted.

The map affords opportunity of studying the influence of the different unsanitary conditions, and each can form their own conclusions as to the relative influence exerted by each cause or each class. The second class, those now to be described, have been the rule to a greater or less extent in almost every case, and have continued to exert their influence when that from the first have been excluded on account of the cold of winter. The only external agency that has been continuous is the ground air, and that must gain access to the house to cause much harm in winter.

The unsanitary agencies, within the dwellings, in all probability have had as much if not more influence in producing sickness and death than those just described, not only in these epidemics of scarlet fever and diphtheria has their agency been felt, but it has been seen in the infectious and contagious diseases that have caused unnecessary deaths year after year. The slaughter of the innocents by their action has been great every year; it is now simply intensified and made evident.

The results have been seen and deplored by intelligent physicians for many seasons, but still the harvest of death went on. It is not often, except when driven by the spur of an epidemic, that rational sanitary measures can be secured. The issue has been squarely put; the action that will be taken the future will show.

The unsanitary conditions in the dwellings that produce disease are somewhat in their prominence.

UNVENTILATED SOIL PIPES.

1st. The almost entire absence of ventilation of the house drains; as the sewers are not ventilated, nor constructed upon any plan or system, the evils are greater. When a sewer is called for one is built without reference to the city as a whole, as unless such

action has been taken recently there has never been any system of sewerage intelligently planned with reference to the wants of the whole city, but each is constructed as best it can, so that as changes have taken place the grade of the old sewers is in many cases defective. The new sewers are ventilated to some extent, but not the old ones. This lack of ventilation of the sewers makes the defect in the houses all the worse, and in some cases a house at the highest level of the sewer, in reality is the ventilator of the sewer. In such cases the water in the traps can often be heard boiling like a kettle over a hot fire from the set back of gases from the sewer. The traps are often siphoned from lack of ventilation, so that there is no obstacle to the entrance of sewer gas. The article of Mr. Gerhard, an authority upon the subject, describes the faulty plumbing of houses built to rent so clearly that there is no need of entering into detail here. Some special points that have been carefully verified will be given.

2d. The absence of traps. Few houses are properly trapped; a large trap in the cellar or just outside the main wall is supposed to be enough. In some cases this becomes itself a nuisance by retaining filth until it putrefies and its presence is often a pure supposition. It is stated to be outside the cellar wall. Because there ought to be one, that much is generally granted.

THE USE OF IMPROPER DRAIN PIPES.

3d. The use of tile drains loosely laid with just a daub of mortar upon the upper surface, to cross the cellar when the situation of the sewer is such that the drain has to be laid across. The use of earthenware or glazed tile is about as bad; neither can be properly calked so as to make air-tight joints, and the earthenware tiles break easily especially when they pass out of the house through the walls to make connections with the sewer. They are often found broken short off either just outside the wall or inside, and the sewage is found to have run down along the cellar wall or under the basement floor. Fig. 1 illustrates this. More than one life has been wasted by this fault. In fact these are common conditions in tenement houses, leaky drains crossing cellar floors, sometimes loosely covered. In some cases the earthenware drain is broken and clogged by the fragments, or else when a new fixture was added in breaking into the drain, a large opening is made which is loosely plastered over. The use of lead soil pipes cannot

be too strongly condemned; they may be all right to-day, and the next the seams may open or corrosions cut through and thus cause mischief. The proper material for house drains is iron of proper thickness, the joints calked with lead, and made gas tight.

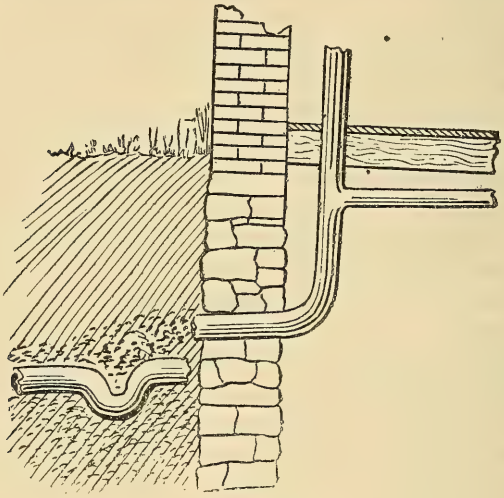

FIG. 1.

UNVENTILATED WATER-CLOSETS.

4th. The improper situation of water-closets in bed-rooms, under stairs, in the middle of halls, so that no means of ventilation exists for the water-closet or bath-room. The halls of the tenement-houses usually built double, are in the centre of the double building. Now in the center of these halls, which sometimes, and indeed often, have a hall bed-room at either end; the bath-room, if there be one, or the water-closet alone is placed so that the two come back to back on each floor in both houses. Those on the lower floor have their traps siphoned and even the sewage forced through when the bath-tubs on the upper floors are used. The lack of any means of ventilation is one of the worst features, especially when, as is often the case, the water-closets open out of bed-rooms.

PERSISTENCE OF DIPHTHERIA.

The effect of these causes, connected with the houses themselves, is especially seen in the persistence of the disease in the city, and its

recurrence in certain localities and in certain houses. This would appear in a much more striking manner if the fatal cases before the date selected for the location of cases on the map had been added in another color, and especially if the fatal cases in the two preceding years, and also those from scarlet fever, had been thus represented also. There are localities and houses where there have been fatal cases in every recent outbreak of these diseases, and in some houses there have been more than one fatal case in each house during the different outbreaks.

These houses and localities are the hot-beds of disease; from these rookeries are sent forth influences that reach far and wide. When inspected we find they are old wooden buildings moved off from better quarters as no longer tenantable, but are patched up so that human beings can, when driven by necessity, find some sort of a shelter. No one need stop to look for sanitary appliances, traps, or ventilation; they are not to be found. The outside surroundings are of a like nature: a small privy, with a shallow vault, for from sixty to a hundred people. The filth from the overflowing vault extends several feet, and it is a lucky accident if the kitchen garbage is not thrown upon the mass to slowly putrefy. In other cases the house is of brick, but overcrowded it may be, in the rear of tall buildings reached by a short dark alley, and hemmed in on all sides by tall buildings, or perhaps an open space on one side. In the small court is a privy used by seventy-five tenants, more or less, behind it the usual garbage heap. The building is overcrowded, its lower timbers half rotten, giving a damp, musty smell throughout.

The influence of these internal causes is seen in the persistence and recurrence of diphtheria and other filth diseases. In such places as these the outbreak starts, here are deaths before other places are reached, and when there is a decline in the malignancy, a fresh influence is sent forth, to rekindle the dying embers.

The persistency that diphtheria shows in these quarters is a marked feature of the epidemic. These are the central points from which the disease spreads. At each new outbreak some new region is infected, and the degree of spread is in proportion to the sanitary condition of the houses and their surroundings. But the disease does not leave its original haunts, the infection would almost seem to cling to the very walls.

The causes then are, for the most part, readily removable. An

ordinance, similar to the model printed, has been submitted to the Common Council, and awaits their action; in it are embraced the essentials only, and such as are in force in many cities, to the benefit of the health and lives of their citizens. When sewers are first put in the house-drains should, by law, be properly ventilated before compelled by pestilence.

A few illustrative cases of defects that come under these general principles, may be of service; in some instances there are special defects associated with those here described.

DIPHTHERIA AND DEFECTIVE WASTE-PIPES.

In many houses of the better class more or less defects can be found, the lack of ventilation of the house drains is the most common. In the cases now mentioned the house was of the better

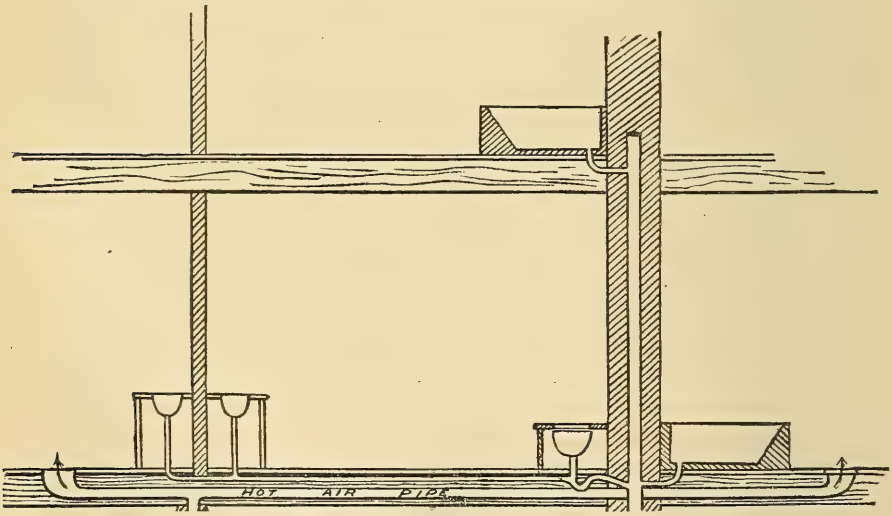

FIG. 2.

class with some of the ordinary sanitary precautions, but an arrangement that has been noticed several times in addition to the other defects described. There were two severe cases of diphtheria, one of them fatal and two milder cases. In the room where the children slept that were attacked by malignant diphtheria there was a wash-basin, the pipe untrapped, and on the other side of the partition was another basin in the room occupied by the other two children, the waste pipe likewise untrapped. Upon tracing this pipe it

was found to empty into the trap of the water-closet, and along the whole course it lay directly upon a hot air pipe from the furnace, which also passed along the side of the trap under the bath-room and into the adjoining chamber. The illustration shows the arrangement, but there should be a partition near the bath-tub. As there was a bath-room on the story above, and one on the other side of the soil-pipe, the trap of the water-closet was liable to be siphoned. The bath-tubs should be shown trapped. The waste-pipe from the two basins did not dip wholly below the seal of the trap, so from the heated pipe there was a constant discharge of foul air into the chambers.

In the following instance there was an iron soil-pipe part way, open at the top, which passed through the casing of the furnace. Above the cellar it was lead. After the cases of diphtheria this lead soil-pipe was examined, when three holes were found, the largest of which would admit a man's fist. There were three very malignant cases, one fatal, and all in the house were more or less poisoned. These cases succeeded each other rather too soon for contagion. There had evidently been severe blood poisoning, as the death was thus caused. The membrane from diphtheria had disappeared three days before the death of the child. The constitutional symptoms were severe, diphtheric paralysis supervened in one child that recovered, and convalescence was long and tedious. The pipe had been examined by a plumber a few months before the sickness, and it was comparatively new. Instances might be multiplied showing the defect from lead pipes where corrosions were found or opened seams.

In one case, also, the lesson was taught that all waste pipes should be accessible, so that defects can be discovered. In this case the lead soil-pipe ran between two rooms, and was concealed by the plastering. There had been much ill-health and general depression, slow nervous fevers, and diarrhœal troubles before the diphtheria appeared. After losing three children from diphtheria, a general overhauling of the plumbing was decided upon. When the soil-pipe above mentioned was taken out it was found coated with a deposit several inches thick in some places, and with a dozen or twenty holes eaten through, of varying size. The children that died slept in a room between whose walls this pipe passed, and in their chamber was an untrapped basin. Di-

rectly opposite their bed was the bath-room, that opened from their chamber. The pan closet that was taken from the bath-room so well illustrates the evils resulting from the use of such fixtures that it is repeated here.

There should be no wood-work casing in a water-closet. Those perfectly open underneath, with encaustic tiling, are the best, by far. The casing covers a loose putty joint, that would not be

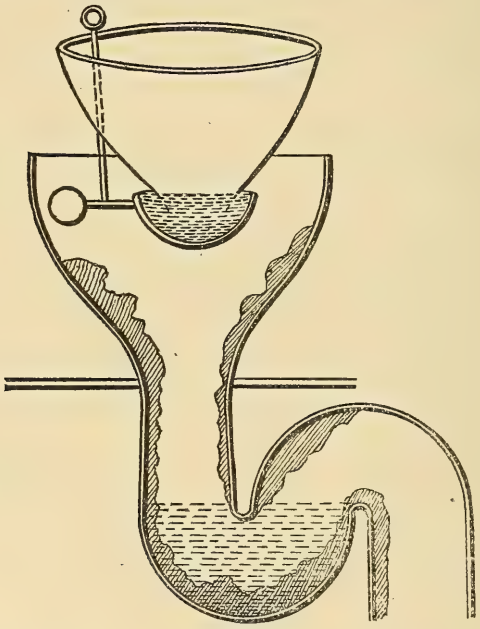

Fig. 3.

tolerated if seen; it often confines more or less polluted air, which is liberated when the seat is raised. In a sanitary sense, the cistern closets are the best, as when the water pressure is low the foul air may gain access to the water pipes.

In the next instance there had been cases of scarlet fever, cholera infantum, or diphtheria in the family every season for eighteen months. The tenant knew that his surroundings were wrong, but could not move for certain reasons. His landlord answered his remonstrances by saying, there is a trap in the cellar; what can any reasonable man ask more? In an inside bed-room, with but one door, there was a small closet, barely large enough to receive

a pan closet. Often sewage was forced out through this by the use of the bath-tubs above, and whenever the water-closets on any of the two floors above them were used, one could hear the air from the unventilated soil-pipe bubble through the trap to this water-closet. As the pipe above was full of water, the foul air must escape somewhere. Here was its only chance. In this room his children slept, and here three of them were slaughtered as certainly as if their throats had been cut with a knife. Whatever may be the theory of the action of air that has been in contact

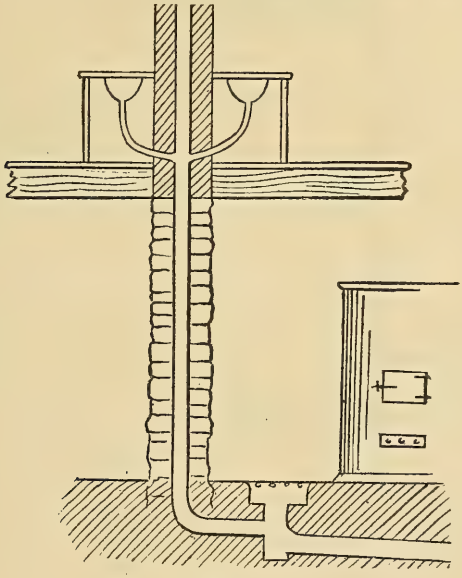

Fig. 4.

with decaying organic matter, when confined in the house and breathed by children, it kills. The poor are at the mercy of the law. Unless it step in and declare for their protection their health and lives go for naught.

In the next case the main drain passed across the cemented cellar floor. Near the furnace was an untrapped opening for surface water, or simply the bell trap,—worse than useless. In this instance the sewage was discharged into an unventilated cess-pool. The basins in the chambers were not trapped, but the chief evil was the opening near the furnace. This was so near that the pipe

was quite sensibly heated, and from the pressure of confined air in the cess-pool and the heat of the furnace, a strong draft was created, pouring foul air into the house constantly. When a series of set wash-tubs were quickly emptied, the current was nearly strong enough to blow out a candle. When cemented the gases still escaped, as was shown by pouring water over it. The bubbles could be seen passing through the water. A more radical change had to be made. The cess-pool was ventilated, also the soil-pipes, and traps were put under every fixture. The condition is shown below :

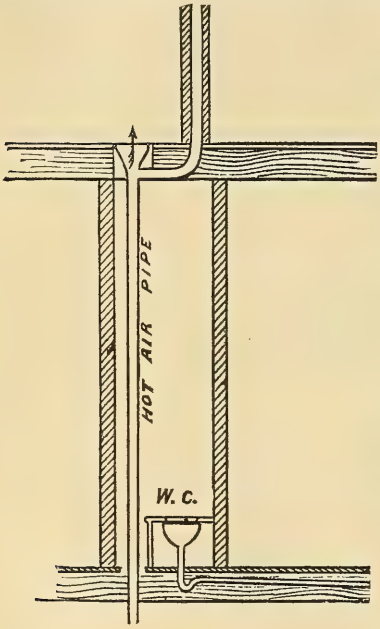

Fig. 5.

There were six cases in this house, two fatal. Other cases, connected with unventilated cess-pools could be given, but the principle is as well shown by one.

In the next case two serious faults existed. The same arrangement of water-closets described, was found in the middle of a hall; but, in addition, the hot-air pipe of the furnace for the chamber of the children that died, passed through the unventilated water-closet, with a loose register. This condition, which has been found several times associated in adults with typhoid fever, and other like diseases, seldom is thought objectionable, until by the unusual severity of sickness, or the number of cases, attention is attracted.

CONTAGION.

The influence of contagion need not be enlarged upon to any great extent. The cases since November apparently have been more thus influenced than any that preceded. They are shown in red on the map, and their situation indicates infection as a cause. But even where the spread of the disease has been by contagion, the influences we have outlined have not been quiescent. The

germs or virus of diphtheria have been nourished or kept alive by these products of organic decay in and around the dwellings. While by infection and contagion the influence of these filth-polluted localities has been extended to the cleanlier portions of the city, the malignancy and persistency of the disease has been also there caused. Kindly Nature has so arranged that if we surround ourselves with sanitary conditions, the tissues will resist any ordinary morbific agency. There must be a condition of receptivity, or else no disease follows exposure. If a person lives under such conditions as we have described as causing this epidemic, when exposed to contagion the powers of resistance have been weakened and disease gains a foothold. The infection of disease is nourished, also, by these conditions, so that it is impossible to ignore their importance in causing disease and death.

That some cases were due to contagion, was shown by those who died within a few days after exposure. Thus, in one case, death followed in forty-eight hours after the membrane appeared, and four days after exposure. In other cases death ensued nearly as soon. The general evidences of blood poisoning are too common to allow us to ignore the influence of unsanitary conditions.

Nature, however, gives us all the aid she can, and, instead of sweeping the whole race from off the earth by one vast pestilence, interposes a barrier, and puts a vital shield between us and death. If you obey her laws and live natural lives, you can walk unharmed amid thousands of unseen foes; but if you have weakened this shield by abuse of any part, so that the power of resistance is lost, the myriad tiny monsters that haunt the polluted air, lurk in the limpid water, or tempting food, enter at this open portal and at once commence their work. These zymogens, that produce diphtheria, typhoid fever, and the like, are destroyers; they live by tearing down the organic tissues, splitting up the complex compounds that form them into the simpler forms that plants can utilize.

CAUSES OF DIPHTHERIA.

The following case shows how rapidly infection sometimes acts:

Two boys were playing for several hours in a vacant lot, in or near one corner of which was a sewer-well untrapped. The boys lost their ball down this man-hole, and one them tried to fish it out for some time, but unsuccessfully. On his way home he was seized with vomiting, and became so sick that he was unable to proceed, and was carried home in a carriage. He went at once to bed, and symptoms of diphtheria were plain enough in twenty-four hours. There was a diphtheric patch upon the tonsils, and the disease developed rapidly.

As there were cases of diphtheria on the line of the sewer, the source of infection was indicated plainly. It is, of course, possible that he had been otherwise exposed, but it is not at all probable, as he had either been away from home, or else isolated at home, so that any other exposure was almost if not quite impossible.

GERMS CARRIED IN THE AIR.

There is considerable evidence that the germs of diphtheria can be carried to considerable distances in the air, and that this distance is greater in time of an epidemic. Thus in Russia in Europe it was observed that it followed the direction of the prevailing winds of the southern portion.* In order to establish his point at least satisfactorily to himself, Prof. Airy analyzed thirty outbreaks, in each of which he had first settled these three points, beyond dispute:

1st. The date of the first case must be exactly known.

2d. No cases of apparently simple "sore throat" preceded the first reported case in the same locality; and

3d. That the outbreak cannot be explained by reference to any of the known modes of the spread of the disease.

These thirty outbreaks he found had absolutely fulfilled his conditions just quoted, and from them he deducts the inference, which he afterwards farther illustrates, that diphtheria can be conveyed to considerable distances by the wind. As twenty-four miles an hour is not an unusual rate for a strong wind, there is no improbability in the idea that the germs could be thus carried, in some cases, even two miles, the extreme limit claimed.

* Airy Diphtheria is sometimes transported by the wind. Trans. Epidem., etc. 1881-2, pp. 50.

Numerous instances are then cited,—too many, the author thinks, to be explained by mere coincidences. We know at least, that the virus of malarial fevers can be carried at least nearly half a mile, as ships that anchor half a mile from the shores of malarious regions are safe, while if they anchor nearer, their crews are attacked with malarial fever.

The frequent outbreaks of diphtheria after the prevalence of a severe wind that has been constantly blowing from the same quarter, are also cited to prove the points taken. Just what the limits of aerial transmission may be, is perhaps not generally settled; but that the disease can be thus conveyed, and to greater distances than usual when an epidemic prevails, appears to be quite generally believed, and instances nearer home could be cited to this effect. Thus from the filthy localities germs are wafted to the better and cleanlier parts of a city, carrying disease and death.

TRANSMISSION BY MILK.

The transmission by milk was discussed last year pretty fully, and instances of such transmission given. Of course no one doubts but that milk directly infected by the discharges from the throat would convey the disease, but the question is whether milk will absorb the germs of disease, and thus serve to produce an epidemic, since last year several epidemics have been traced to the milk supply. That at Davenport, in England, is fully as clear as any cited last year.

There were thirty-one cases, five of which were fatal; all were customers of one dairy. The washing the cans and drying the cloths used about the dairy was carried on in an outhouse, in one corner of which the privy was situated, where all the excretions and discharges, the throat inclusive, from a diphtheria patient were thrown. The confined air rendered the infection much more likely, as a free circulation of air has been shown to be prejudicial to bacterial life.

DIFFUSION BY SCHOOLS.

The diffusion of the disease by schools, and the spread by contagion, are so well known, and have been so often illustrated, that it is only necessary to mention that contagion is one of the admitted means for the spread of diphtheria. It is not as contagious as

scarlet fever, but may be taken in through the lungs. It is more decidedly an *infectious* disease: this is a very strongly-marked characteristic.

That water also may become infected, and then cause diphtheria, is admitted; but the instances are not so common from this as from other methods. The following is illustrative:

DIPHTHERIA AND FILTH.

There were eight cases in one family in Thompsonville; two fatal. There was a small back-yard containing, as usual, the well and privy. But there was also the decaying garbage accumulated from—how long no one could tell. The deposit was a foot deep on an average over nearly the whole area sloping towards the well. The deposit was made up of vegetable and animal filth,—and different portions were in different stages of decomposition,—in fine, the kitchen refuse for the whole autumn, winter, and spring, of a large family. The preceding family lost some members by scarlet fever. The ground sloped towards the well, and bed-room windows on the first floor opened directly upon this deposit of filth. Here were all the elements needed for developing the germs of diphtheria and increasing their malignancy.

The instance is given as the type of a large class of cases where, with local conditions more or less aggravated, like these described, diphtheria occurs in isolated families and attacks the whole household. When the conditions are favorable the malignancy is so increased that adults are attacked as well as children, although it is a disease of which children are the usual victims.

In another instance, not in the same town, there was a privy in the cellar, with no vault, but a large trough leading by a six-inch pipe to an untrapped cess-pool. At the upper end of the trough a large pipe emptied which discharged the water from several sinks on the floors above, and was supposed to flush the trough. Twelve feet distant was an uncovered brick cistern, which was the water supply for the family.

The sad instance of the family at Riverton is a forcible illustration of the relations of diphtheria and filth. In this case all the family except the father sickened and died of diphtheria. Upon investigation it was found that the kitchen sink discharged directly into the cellar where a slimy, putrescent mass was discovered. The family had occupied the house but a short time and inherited

the evils caused by the disregard of the plainest laws of health, of their predecessors.

It is claimed that sewers cause more evils than they relieve, but as bad as they often are by neglect, not of necessity, the evils from stored-up filth are far greater, and are cumulative, that is, constantly increasing. The cases in Bristol illustrate the evils from cess-pools improperly constructed. In one family there were six severe cases, three of which were fatal; the waste pipes were not trapped and led directly into a tightly-covered cess-pool, which was not ventilated in any other way except into the house by the waste-pipes. This is not uncommon I find where cess-pools exist. In such cases, however, there is always ill health, and here, when any zymotic disease prevails, it finds its victims.

There is no need to multiply cases. A few typical ones have been given to show that the cause of disease is neglect of precautions, easily taken, in a large proportion of cases. The dangers from negligence and disregard of well known principles are equally great in case of cess-pool, vault, or sewer. Indeed when the balance is taken, the sewers are by far less dangerous even with the present faulty construction.

The pollution of earth, air, and water, that arises from stored-up filth, and its constant extension as the amount of soil saturation increases in its relation to so many types and forms of zymotic disease, the connection of epidemics with soil saturation and water pollution, are evils that are fully equal to those from sewer-gas; in fact, there are similar evils and none of the advantages from sewers. With a little care and intelligent watchfulness, and proper construction to begin with, there need be no danger to health from sewers, nor indeed from vaults or cess-pools, but the latter require very frequent attention, and that constant, to render them entirely inoffensive.

THE CONTAGIOUSNESS OF SCARLET FEVER.

The contagion of scarlet fever has been repeatedly shown in the most marked manner. In one instance a lady, not knowing the danger, called in a neighbor's child to play with hers that was convalescent from a mild attack of scarlet fever. In a week the child, thus carelessly exposed, sickened with scarlet fever, and died in forty-eight hours, of a most malignant type. Of course the danger was not realized, or believed in, or else that child would have been alive to-day.

In one instance, recently, the infection was received from paper-rags. The families were isolated, and no other source of infection could be found, after a careful search. There were five cases—three fatal; the adults in both families had severe form of ulcerated sore throat. Dr. Griswold, of Manchester, who reports the cases, states that they were the most malignant he ever saw, and attributes the infection to paper-rags, as the parents—one or both—worked in the paper-mills. The cases were distant from any large village; nor was there at the time any scarlet fever in any village or city near. It is well known that scarlet fever can be thus communicated, and it is recognized as one of the dangers such operatives are liable to. It is not stated, however, whether the rags had been gathered from an infected locality.

In one instance, a room, in which, several years before, a child had died from scarlet fever, but which was disused since, under an unusual call for rooms, was allotted to a mother and child. The child was attacked in a week with malignant scarlet fever, and died in three days; the mother had a very severe diphtheritic throat, which was very intractable to treatment. In this case every precaution had been taken, except papering the room. I examined some of the dust scraped from the paper, which was of a flocculent nature, and found some epithelial scales among the mass. Had I a physiological laboratory, I should have inoculated the scales on some animal. The dust of occupied rooms almost always contains more or less epithelial scales; hence, it is reasonable to suppose that the germs of disease are also contaminating the air about those sick with zymotic diseases.

These instances are numerous where carelessness, or ignorance, leads to the sickness and death of others. In this case, a dress-maker had a child ill with scarlet fever of the mildest type—and here lies the danger, usually. If the case were severe, almost any one would be careful; but as it was so mild, and excited no alarm in regard to her own child, she did not dream of danger, made the dress with the child about her, and even threw it across the child's crib where it lay sleeping. The young girl for whom it was intended, after wearing it once, sickened and died, a few days after seizure, of malignant scarlet fever. In many cases the mildest cases transmit the severest and most malignant type.

TREASURER'S REPORT.

Expenditures from Dec. 1, 1882, to Dec. 1, 1883,	$2,001.57
Salary of Secretary, 1883,	1,000.00
	$3,001.57
Cash on Deposit,	311.31
Total,	$3,312.88

RECEIPTS.

Cash,	$3,000.00	
Balance from 1882,	312.88	
		$3,312.88
Bills outstanding, estimate,		526.00

C. W. CHAMBERLAIN, M.D.,
Treasurer.

Approved,
C. A. LINDSLEY, M.D.,
Auditor.

DETAILED STATEMENT.

Printing,		
Bureau Vital Statistics,	$295.75	
Sanitary Department,	196.10	
The Case, Lockwood & Brainard Co.,		$491.85
American Photo-Lithographic Company,		387.63
Postage, Express, and Telegrams,		207.25
Traveling Expenses,		200.45
For Library,		197.87
Physical Apparatus,		140.20
Clerical Services,		115.75
Sanitary Experts,		140.50
Burr Index Co.,		51.60
Legal Services,		44.00
Stationery, etc.,		24.47
		$2,001.57

JANUARY 2, 1884.

I have examined the accounts of the Treasurer of the State Board of Health for the year ending Nov. 30, 1883, and have compared them with the accompanying vouchers, and find them correct.

C. A. LINDSLEY, M.D.,
Auditor of the Board.

The following indorsement is copied from the account book of the Board:

HARTFORD, Conn., Jan. 8, 1884.

This will certify that we have examined the foregoing statement of C. W. Chamberlain, M.D., Treasurer of the State Board of Health, for the year ending Nov. 30, 1883, compared the vouchers therewith, and find the same correct, showing a balance due the State amounting to three hundred and eleven dollars and thirty-one cents, including bills paid to date.

THOMAS I. RAYMOND, } *Auditors*
GEORGE M. GUNN, } *for the State.*

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